SOIL SURVEY

Kenosha and Racine Counties Wisconsin

Issued December 1970

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
UNIVERSITY OF WISCONSIN
Wisconsin Geological and Natural History Survey
Soils Department
and
Wisconsin Agricultural Experiment Station

Major fieldwork for this soil survey was completed in 1965. Soil names and descriptions were approved in 1967. Unless otherwise indicated, statements in the publication refer to conditions in the counties in 1965. This survey was made cooperatively by the Soil Conservation Service and the Wisconsin Geological and Natural History Survey, Soils Department, and the Wisconsin Agricultural Experiment Station, University of Wisconsin, as part of the assistance furnished to the Kenosha County and the Racine County Soil and Water Conservation Districts.

The fieldwork that is the basis for this soil survey was partly financed by Kenosha and Racine Counties; by the Southeastern Wisconsin Regional Planning Commission; and by a joint planning grant from the State Highway Commission of Wisconsin; the U.S. Department of Commerce, Bureau of Public Roads; and the Department of Housing and Urban Development; under provisions of the Federal Aid Highway Legislation and Section 701 of the Housing Act of 1954, amended.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or can be purchased on individual order from the Cartographic Division, Soil Conservation Service, USDA, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Kenosha and Racine Counties contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in judging the suitability of tracts of land for agriculture, industry, or recreation.

Locating Soils

All of the soils of Kenosha and Racine Counties are shown on the detailed map at the back of this survey. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. This guide lists all of the soils of the two counties in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the capability unit, recreation group, wildlife group, and urban trees group in which the soil has been placed.

Individual colored maps showing the relative suitability or limitations of soils for many specific purposes can be developed by using the soil map and information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils in the soil descriptions and in the discussions of the capability units, recreation groups, and wildlife groups.

Foresters and others can refer to the subsection "Woodland and Urban Trees," where the soils of the area are grouped according to their suitability for trees in various kinds of plantings.

Game managers, sportsmen, and others concerned with wildlife will find information about soils and wildlife in the subsection "Use of Soils for Wildlife."

Community planners and others concerned with suburban development can read about the soil properties that affect the choice of homesites, industrial sites, schools, and parks in the subsections "Engineering interpretations" and "Recreational Uses of Soils."

Engineers and builders will find, under "Engineering Uses of the Soils," tables that give engineering descriptions of the soils in the area and that name soil features that affect engineering practices and structures.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation and Classification of Soils."

Newcomers in Kenosha and Racine Counties may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the Area," which gives additional information about the counties.

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SOIL SURVEY OF KENOSHA AND RACINE COUNTIES, WISCONSIN

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UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH THE WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY, SOILS DEPARTMENT, AND THE WISCONSIN AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF WISCONSIN

KENOSHA AND RACINE COUNTIES are along Lake Michigan in the southeastern corner of Wisconsin (fig. 1). Both counties are bordered on the west by Walworth County. Racine County is bordered by Waukesha and Milwaukee Counties on the north, and Kenosha County adjoins the State of Illinois on the south. The total land area of the two counties is about 610 square miles or 390,400 acres. Kenosha and Racine, the largest cities, are the seats of government for their respective counties.

These counties lie between two great metropolitan centers, Milwaukee and Chicago. They are counties of fertile farms, but the influence of industrial employment is so great that only 3 percent of the labor force in Racine County, and only 5 percent of Kenosha County, is employed in farming. These percentages compare with 18 percent for the State of Wisconsin and 12 percent for the Nation.

About half of the labor force in the two counties is employed in manufacturing. This compares with 33 percent for the State as a whole. Average income per farm is substantially above the State average, but the total farm income is only about 5 percent of the total wages paid by industry.

Dairying is the principal source of income for farmers in these counties. Farming is diversified, however, and truck crops are important in the farm economy.

The soils formed mainly in material that was laid down through glaciation. Most of the area between Lake Michigan and the Fox River is occupied by soils having a high content of clay. Loamy, rolling soils lie chiefly west of the Fox River.

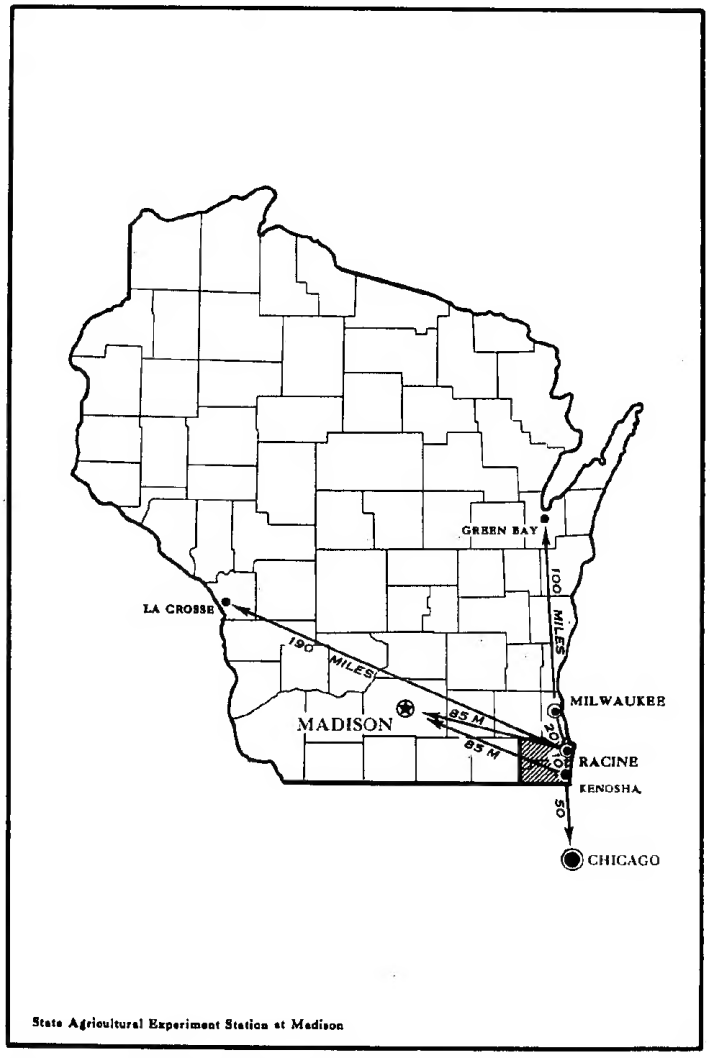

Figure 1.—**Location of Kenosha and Racine Counties in Wisconsin.**

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Kenosha and Racine Counties, where they are located, and how they can be used.

They went into the counties knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the counties, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. To use this survey efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Fox and Morley, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that go with their behavior in the natural, untouched landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Fox loam and Fox silt loam are two soil types in the Fox series. The difference in texture of their surface layers is apparent from their names.

Some types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Fox loam, 2 to 6 percent slopes, is one of several phases of Fox loam, a soil type that ranges from nearly level to sloping.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map in the back of this survey was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soil are so intricately mixed and so small in size that it is not practical to show them separately on the map. Therefore, they show this mixture of soil as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it, for example, Casco-Miami loams. Most surveys include areas where the soil material is so rocky, so shallow, or so frequently worked by wind and water that it cannot be classified by soil series. These areas are shown on the map like other mapping units, but are given descriptive names, such as Alluvial land or Marsh, and are called land types.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in a way that it is readily useful to different groups of readers, among them farmers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil surveys. On the basis of the yield and practice tables and other data, the soil scientists set up trial groups, and then test these by further study and by consultation with farmers, agronomists, engineers, and others. The scientists then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Kenosha and Racine Counties. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, or choosing the site for a building or other structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The nine soil associations in Kenosha and Racine Counties are discussed in the following pages.

1. Varna-Elliott-Ashkum Association

Well-drained to poorly drained soils that have a silty clay loam to clay subsoil; formed in thin loess and the underlying clay loam or silty clay loam glacial till on ridges and knobs

This association lies east of the Fox River and west of State Highway 32 in Kenosha and Racine Counties. The soils are nearly level and gently sloping; they occur on low, very broad ridges and knobs that are dissected by drainageways and depressions. The association is the largest in the two counties. It occupies 129,070 acres, or about 34 percent of the total land area.

The Varna, Elliott, and Ashkum soils are dominant. Of the total acreage in the association, the Varna soils account for 15 percent; the Elliott soils, 15 percent; and the Ashkum soils, 15 percent. The minor soils are the Markham, Beecher, and other soils, all of which make up about 55 percent of the association.

The major soils formed in 10 to 20 inches of windblown silt and in the underlying clayey and silty glacial till. The well drained or moderately well drained Varna soils are on ridges and knobs, where the native vegetation was prairie grasses. The somewhat poorly drained Elliott soils and the poorly drained Ashkum soils are in depressions and drainageways, where the native plant cover was water-tolerant grasses. Elliott and Ashkum soils have a subsoil in which dull brown and gray are abundantly mottled with red and yellow. These colors are evidence of a high water table.

The soils of this association are well suited to crops and are some of the most important soils for farming in the survey area. Because they have high natural fertility, they are extensively used for producing forage crops, wheat, oats, soybeans, and corn. In places where the soils are near metropolitan areas, much of the acreage is in residential developments. On about 30 percent of the acreage, however, slow permeability and a high water table are soil features that severely limit use of onsite sewage disposal systems.

2. Morley-Beecher-Ashkum Association

Well-drained to poorly drained soils that have a silty clay or silty clay loam subsoil; formed in thin loess and the underlying clay loam or silty clay loam glacial till on ridges and knobs

This association occurs in areas throughout most parts of the two counties. The soils are nearly level and gently sloping, and they occupy low, very broad ridges and knobs that are dissected by drainageways and depressions. The association covers 109,300 acres, or about 28 percent of the survey area.

Morley, Beecher, and Ashkum are the major soils. The Morley soils make up about 60 percent of the association; the Beecher soils, about 10 percent; and the Ashkum soils, about 10 percent. Minor soils, including the Blount and Markham, account for the remaining 20 percent.

The major soils formed in a 10- to 20-inch cap of windblown silt and in the underlying clayey and silty glacial till. The well drained or moderately well drained Morley soils are on ridges and knobs. They formed under a forest of hardwoods and have a light-colored surface layer. The somewhat poorly drained Beecher soils and the poorly drained Ashkum soils lie in depressions and drainageways. Here, the native vegetation was water-tolerant grasses and the surface layer is dark colored. In the subsoil of Beecher and Ashkum soils, dull brown and gray are marked with abundant red and yellow mottles. These colors are evidence of a high water table.

The soils of this association are some of the most important for farming in the two counties. They have high natural fertility and are well suited to crops. Grown extensively are forage crops, wheat, oats, soybeans, and corn. A large acreage near metropolitan areas is used for homesites. On about 20 percent of the association, use of the soils for onsite sewage disposal systems is severely limited by slow permeability and, in places, by a high water table. The Morley soils are subject to water erosion.

3. Hebron-Montgomery-Aztalan Association

Well-drained to poorly drained soils that have a loam to silty clay subsoil; underlain by clayey to loamy lacustrine and outwash material on hills, knobs, and lake plains

This association is on lake plains adjoining or close to Lake Michigan, and it also occurs on low hills and knobs. The soils are nearly level to rolling. About 66,890 acres, or 17 percent of the total survey area, is in this association.

The Hebron, Montgomery, and Aztalan soils are dominant. The Hebron soils make up about 15 percent of the association; the Montgomery soils, about 15 percent; and the Aztalan soils, about 10 percent. In addition, there are small areas of Navan, Symerton, Saylesville, Saylesville, dark surface variant, and Martinton soils. These minor soils cover about 60 percent of the total acreage.

The major soils consist of loamy material that is 18 to 36 inches thick and is underlain by lacustrine silt and clay. The well drained or moderately well drained Hebron soils are on hills and knobs, where they formed under hardwood forest. They have a light-colored surface layer. The poorly drained Montgomery soils occupy broad, nearly level areas, where the native plant cover was water-tolerant grasses. Montgomery soils have a gray subsoil that is commonly mottled with red and yellow. These colors show the influence of high ground water. The somewhat poorly drained Aztalan soils lie on flats and in drainageways and depressions.

The soils of this association are highly suitable for farming and, where they occur near Lake Michigan, are used extensively for vegetable crops. Elsewhere in the counties, they are used for corn, small grain, soybeans, and forage crops. Some areas are in residential developments. Erosion is a hazard on the Hebron soils, and improved drainage is needed in the Montgomery and

Aztalan soils. Because permeability is slow and, in places, the water table is high, the soils have severe or very severe limitations that restrict their use for onsite sewage disposal systems.

4. Fox-Casco Association

Well-drained soils that have a clay loam and silty clay loam subsoil; moderately deep to shallow over sand and gravel, on stream terraces

This association consists of nearly level to rolling soils that are mainly on high terraces but also occur on hills. Most of the acreage is on a high terrace west of the Fox River (fig. 2), and a few isolated areas are in Salem and Somers Townships in Kenosha County. The total area of the association is 39,760 acres, or about 10 percent of the two counties.

Dominant are the well-drained Fox and Casco soils. Fox soils occupy about 50 percent of the total acreage, and Casco soils, about 30 percent. Also, there are small areas of Rodman, Matherton, Sebewa, and St. Charles soils that make up the remaining 20 percent.

The major soils formed in a silt mantle, less than 20 inches thick, that is underlain by stratified sand and gravel. Their native vegetation was hardwood forest. Nearly level and gently sloping Fox soils are on terraces, and sloping Fox soils are on adjacent hills and ridges. All of these soils have a surface layer and subsoil ranging from 20 to 40 inches in total thickness. Sloping to moderately steep Casco soils also are on the hills and ridges; their surface layer and subsoil have a combined thickness of 12 to 20 inches.

Most of this association is highly suitable for farming, and a large acreage is cultivated. The sloping soils are erodible if cropped, and they tend to be droughty late in summer. The steeper soils can be used for pasture, woodland, and wildlife. In places where slopes are less than 6 percent, the soils are suitable as building sites and have few or no limitations affecting use for onsite sewage disposal systems. In addition, soils of this association are a good source of sand and gravel.

***Figure 2.*—Nearly level soils of the Fox-Casco association on a high terrace west of the Fox River.**

5. Houghton-Palms Association

Very poorly drained organic soils; in basins and depressions

This association lies in basins and depressional areas, mainly in the western part of these counties. The soils are nearly level and very poorly drained. About 13,410 acres, or 3 percent of the survey area, is in the association.

Houghton and Palms are the major soils. The Houghton soils make up about 75 percent of the total acreage, and the Palms soils, about 15 percent. Small areas of Ogden and Sawmill soils, and of Alluvial land and Wet alluvial land, account for the remaining 10 percent.

The Houghton and Palms soils formed in the decomposed or partly decomposed remains of water-tolerant grasses and sedges. Houghton soils consist of muck and mucky peat that extend to a depth of 42 inches or more and are underlain by mineral soil material. In the Palms soils, muck is 12 to 42 inches thick over loam.

If the soils of this association are drained, they are suitable for farming. Locally, they are intensively used for crops, principally vegetable crops, corn, and soybeans. In Norway Township, Racine County, they are used for producing sod. Undrained areas are pastured or inhabited by wildlife. Because the water table is high, use of the soils for building sites and onsite sewage disposal systems is severely limited.

6. Miami Association

Well-drained soils that have a silty clay loam and clay loam subsoil; formed in thin loess and the underlying loamy glacial till on ridges and knobs

This association is on rolling hills, drumlins, and ridges in the western part of the two counties. Generally, the soils are sloping and gently sloping. The association covers 15,970 acres, or about 4 percent of the total land area.

Miami soils are dominant and make up about 50 percent of the association. The remaining acreage is occupied by McHenry, Conover, Pella, and other minor soils. Small areas of the Hochheim and Theresa soils occur in the northwestern part of Waterford Township, Racine County.

The well-drained Miami soils formed in a mantle of silt less than 20 inches thick and in the underlying loam or sandy loam glacial till. The native vegetation was a forest of hardwood trees. In this association the Miami soils underlain by sandy loam glacial till are more strongly sloping than the other Miami soils.

The soils of this association are suitable for farming, but they are only moderately important because their acreage is relatively small. Corn, forage crops, and small grain are the principal crops grown. The more sloping areas are used mainly for pasture and woodland, and some of these areas are used for recreation. Where the soils are gently sloping or sloping, they have only slight or moderate limitations that affect their use for homesites.

7. Casco-Rodman Association

Well-drained and excessively drained soils that have a clay loam or gravelly loam subsoil; shallow over sand and gravel, on stream terraces and morainic ridges

This association is on terraces, morainic ridges, and kettleholes west of the Fox River. The soils are sloping to steep and loamy. The association occupies 7,040 acres, or about 2 percent of the survey area.

The dominant soils are the Casco and the Rodman. Casco soils make up 45 percent of the association, and Rodman soils, 35 percent. Small areas of Fox, Matherton, and Sebewa soils make up the remaining 20 percent.

The major soils formed under hardwood forest and are shallow to stratified sand and gravel. The well-drained Casco soils are concave and less strongly sloping than the others. Their surface layer and subsoil have a combined thickness of 10 to 20 inches. The excessively drained Rodman soils are convex and are steeper than the Casco soils; their surface layer and subsoil have a total thickness of less than 10 inches.

The soils of this association are not well suited to crops and are of little value to farming. Most of the acreage is in trees or permanent pasture, and only small areas are cultivated. Suitable uses include recreation, permanent pasture, woodland, and wildlife. Because the soils are steep, droughty, and susceptible to erosion, they have severe or very severe limitations that restrict their use for community developments. The soils are a good source of sand and gravel.

8. Boyer-Granby Association

Well-drained to very poorly drained soils that have a loam to sand subsoil; underlain by sandy glacial outwash on ridges and knobs and in drainageways and depressions

This association consists of nearly level and gently sloping soils that occupy a low, long, narrow terrace adjoining Lake Michigan. It is an area of low ridges interspersed with depressions and swales. The association covers 5,760 acres, or about 1 percent of the two counties.

Dominant in the association are the Boyer and Granby soils. Boyer soils make up about 35 percent of the acreage; Granby soils, brown subsoil variant, about 20 percent; and normal Granby soils, about 15 percent. In addition, there are small areas of Yahara and Wasepi soils that make up the remaining 30 percent.

The major soils formed in places where the native plant cover was prairie grasses and water-tolerant grasses. These soils are underlain by sandy glacial outwash. The well-drained Boyer soils occupy the ridges and have a light-colored surface layer. The somewhat poorly drained Granby soils, brown subsoil variant, and the poorly drained normal Granby soils are in the depressions and swales between the ridges. They have a dark-colored surface layer. In all of the Granby soils, the subsoil is characterized by dull brown and gray that are abundantly mottled with red and yellow. These colors are evidence of a high water table.

The soils of this association are not well suited to crops, and they have little value for farming. Because

natural fertility is low, only a small acreage is cultivated. Wildlife and recreation are the chief uses, and residential developments are extensive near metropolitan areas. For onsite sewage disposal systems, limitations are only slight on the well-drained soils but are severe or very severe on soils having a high water table. The Boyer soils are droughty and, unless protected, are subject to wind damage.

9. Warsaw-Plano Association

Well-drained soils that have a loam to silty clay loam subsoil; moderately deep to deep over sand and gravel, on stream terraces

This association lies on terraces west of the Fox River. Here, the soils are nearly level and gently sloping. The association covers 3,200 acres, or about 1 percent of the survey area.

The well-drained Warsaw and Plano soils are dominant, but small areas of Lorenzo and Kane soils also occur. The Warsaw soils make up about 70 percent of the association; the Plano soils, about 20 percent; and the minor soils, the remaining 10 percent.

The Warsaw soils formed in a silt cap less than 20 inches thick and are 24 to 40 inches deep over sand or sand and gravel. The Plano soils formed in silt 30 to 50 inches thick and are 40 or more inches deep over stratified sand and gravel. On all of these soils, the native plant cover was prairie grasses.

Although the soils of this association occupy only a relatively small part of the two counties, they are among the best soils for farming and in most places are cultivated. Crops grown extensively are corn, forage crops, small grain, and soybeans. Erosion is a hazard on the sloping soils. Most of the association is highly suitable for building sites and for onsite sewage disposal systems.

Use and Management of the Soils

The first part of this section explains how soils are grouped according to their capability and describes the capability units in Kenosha and Racine Counties. In the second part there are predictions of average yields of the principal crops grown in the counties under two levels of management. Other parts describe the use of soils for recreation, discuss wildlife, explain engineering uses of soils, and discuss woodland and urban trees.

Capability Groups of Soils

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The classification does not apply to most horticultural crops, or to rice and other crops having special requirements. The soils are classified according to degree and kinds of permanent limitation, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils; and without consideration of possible major reclamation.

In the capability system all the soils are grouped at three levels, the capability class, subclass, and unit. These are discussed in the following paragraphs.

Capability Classes, the broadest grouping, are designated by Roman numerals, I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have some limitations that reduce the choice of plants or require special conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that restrict the choice of plants, require very careful management, or both.

Class V soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover.

Class VI soils have severe limitations that make them generally unsuitable for cultivation and limit their use largely to pasture, or range, woodland, or wildlife food and cover.

Class VII soils have very severe limitations that make them unsuitable for cultivation and restrict their use largely to grazing, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows the main limitation is risk of erosion unless close-growing plant cover is maintained; *w*, shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is droughty, shallow, or stony; and *c*, used in only some parts of the United States, but not in Kenosha and Racine Counties, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only subclasses indicated by *w*, *s*, and *c*, because the soils in it are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to

the subclass symbol, for example, IIe–1 or IIIw–3. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation, and the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph. The Arabic numeral specifically identifies the capability unit within each subclass.

Management by capability units

In the following pages, the capability units in Kenosha and Racine Counties are described and suggestions for the use and management of the soils are given. The capability units are not numbered consecutively, because not all of the units used in Wisconsin are in these counties.

Discussed for each unit are the characteristics of the soils in the unit, the suitability of these soils for crops, and management suitable for the soils. Although each soil in the two counties differs somewhat from the others, certain practices of management are needed on all of the soils that are cultivated. Adding manure, using cover crops, and returning crop residues are among the practices that supply organic matter and help to improve fertility, preserve good tilth, and control erosion.

The names of the soil series represented are mentioned in the description of each capability unit, but this does not mean that all the soils of a given series appear in the unit. To find the names of all the soils in any given capability unit, refer to the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT I–1

This unit consists of nearly level, well-drained, loamy soils of the Plano, St. Charles, Worthen, and Zurich series. These soils have moderate to high natural fertility. They are moderately permeable and have medium to high available moisture capacity. Maintaining fertility and providing a regular supply of organic matter are the main concerns of management.

The soils in this unit are suited to corn, oats, wheat, soybeans, and alfalfa grown for hay. They also can be used for permanent pasture, trees, and wildlife habitat.

These soils can be row cropped continuously if management is intensive and provides return of crop residue to the soil. Tillage should be kept to a minimum.

CAPABILITY UNIT IIe–1

In this unit are gently sloping, well-drained, loamy soils that occupy low ridges, knobs, terraces, and old lakebeds. These soils are of the Griswold, Hochheim, McHenry, Miami, Ringwood, St. Charles, Sisson, Theresa, and Zurich series. They are subject to moderate erosion if they are cultivated and not protected. Natural fertility is moderate to high, permeability is moderate or moderately slow, and the available moisture capacity is medium to high. Reducing runoff and controlling erosion are the main concerns of management, but maintaining fertility and supplying organic matter also are important.

The soils in this unit are suited to corn, oats, and other common crops, as well as to alfalfa and bromegrass grown for hay. In addition, they can be used for permanent pasture, trees, and wildlife habitat.

Terracing and contour stripcropping are suitable practices that help to control water erosion on these soils. If terraces, waterways, and stripcropping are used, the cropping system can safely include more years of row crops and fewer years of hay than it can if these practices are not provided.

CAPABILITY UNIT IIe–2

This unit consists of well drained and moderately well drained, gently sloping, loamy soils that are underlain by sand and gravel. These soils are of the Dresden, Fox, Knowles, and Warsaw series. They are moderately susceptible to erosion if they are used for crops and not protected. Natural fertility is moderate, permeability is moderate, and the available moisture capacity is medium. Controlling runoff and checking erosion are the main concerns of management, but maintaining fertility and providing an adequate amount of organic matter also are important.

The soils in this unit are suited to corn, wheat, soybeans, oats, and alfalfa grown for hay, and other common crops. They also can be used for permanent pasture, woodland, and wildlife habitat.

Terracing and contour stripcropping are suitable measures for slowing runoff and reducing erosion. If these practices are applied, together with waterways, the crop rotation can safely include more years of row crops and fewer years of hay than it can if erosion control measures are not provided.

CAPABILITY UNIT IIe–6

This unit is made up of well drained and moderately well drained, gently sloping, loamy soils that have a clayey subsoil. These soils are of the Hebron, Markham, Morley, Saylesville, Symerton, and Varna series. They are moderately susceptible to erosion, and some of them are eroded. Natural fertility is moderate to high, permeability is moderately slow to slow, and the available moisture capacity is high to very high. The dark-colored soils in this unit have a higher organic-matter content than the other soils, and they are easier to maintain in good tilth. The plow layer of the eroded soils contains some of the clayey subsoil and is in poor tilth.

In using and managing the soils of this unit, the slow intake of water and the risk of erosion are the main limitations. Other concerns are supplying organic matter and maintaining fertility.

These soils are suited to such crops as corn, soybeans, wheat, oats, and alfalfa grown for hay. They also can be used for permanent pasture, trees, and wildlife habitat.

Terracing and contour stripcropping are suitable for controlling runoff and checking soil losses (fig. 3). In fields where terraces, waterways, and stripcropping are provided, more years of row crops and fewer years of hay can be safely used in the rotation than in fields where no measures to control erosion are applied.

CAPABILITY UNIT IIw–1

The soils in this unit are loamy or clayey, nearly level or gently sloping, and poorly drained or very poorly drained. They are of the Ashkum, Drummer, Montgomery, Navan, and Pella series. Natural fertility is high, permeability is slow to moderate, and the available moisture capacity is high.

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Figure 3.—**Contour stripcropping (left) helps to control erosion on Morley silt loams. Stand of trees (right) also is on Morley soils.**

These soils are subject to ponding and have a seasonal high water table less than 1 foot below the surface. Excess water is the main limitation. Other concerns are preserving good tilth and maintaining fertility.

If the soils in this unit are properly drained, they are suited to corn, oats, wheat, soybeans, and vegetables. Lodging is common in small grains, however, and alfalfa is subject to damage by frost heaving. In areas where drainage is inadequate, alsike or Ladino clover can be substituted for alfalfa. The soils also are suitable for permanent pasture and wildlife habitat, but trees generally do not grow well, because of the high water table.

Good structure can be maintained if fields are worked only when they are dry enough that the plow layer will not puddle. This is especially important in farming the Montgomery soil. Row crops can be grown continuously in fields where management is intensive and includes keeping tillage to a minimum, providing a large supply of organic matter, and maintaining a high level of fertility.

CAPABILITY UNIT IIw–2

This unit consists of somewhat poorly drained, nearly level and gently sloping, loamy soils that have a clayey subsoil. These soils are of the Aztalan, Beecher, Blount, Conover, Elliott, Martinton, and Radford series. Their main limitation is a seasonal high water table less than 3 feet below the surface. Other concerns of management are preserving good tilth and maintaining fertility. The soils have moderate to high natural fertility, slow to moderate permeability, and medium to high available moisture capacity.

If properly drained, these soils are suited to corn, oats, wheat, soybeans, and vegetable crops. In areas not adequately drained, alfalfa is subject to winter killing and to damage by frost heaving. Here, red clover, alsike clover, or Ladino clover can be substituted for alfalfa. Other suitable uses for these soils are permanent pasture, woodland, and wildlife habitat.

If management is intensive on these soils, row crops can be safely grown year after year.

CAPABILITY UNIT IIw–5

In this unit are somewhat poorly drained and poorly drained, nearly level and gently sloping, loamy soils of the Kane, Matherton, and Sebewa series. Natural fertility is moderate, permeability is moderate, and the available moisture capacity is medium. Some of the soils have a clayey substratum.

The soils in this unit have a seasonal high water table at a depth of less than 3 feet, and this is their main limitation. Other concerns are the maintenance of good tilth and fertility and, in gently sloping areas, the control of erosion.

After these soils are properly drained, they are well suited to corn, oats, wheat, and soybeans. In addition, they are good soils for permanent pasture, trees, and wildlife habitat.

If management is intensive, row crops can be safely grown for more years in the rotation than under the management commonly practiced.

CAPABILITY UNIT IIw–13

This unit consists of well-drained to very poorly drained, loamy soils of the Dorchester, Lawson, and Wallkill series. These soils have a seasonal high water table less than 3 feet below the surface, or are subject to frequent flooding, or both. They are high in natural fertility, are moderately permeable, and have very high available moisture capacity. The lower part of the Wallkill soil is muck.

In using and managing the soils of this unit, excess water is the main limitation. Other concerns are the prevention of streambank cutting, preserving good tilth, and maintaining fertility.

If properly drained, these soils are well suited to corn, oats, wheat, hay, and soybeans. Alfalfa does not grow well in areas where the water table is seasonally high. The soils are suitable for permanent pasture and as wildlife habitat.

Tiling can be used for draining the Wallkill soil if an outlet is available. For removing excess water from the Lawson soil, tile lines are not suitable but open ditches and surface drains can be used. If management is intensive, row crops can be safely grown for more years in the rotation than under the management commonly practiced.

CAPABILITY UNIT IIs–1

This unit is made up of well drained and moderately well drained, nearly level, loamy soils of the Fox and Warsaw series. These soils are underlain by sand and gravel, and some of them have a clayey substratum. Natural fertility is moderate, permeability is moderate, and the available moisture capacity is medium. The dark-colored soils in the unit have a higher organic-matter content than the other soils, and they are more easily kept in good tilth.

In using and managing the soils of this unit, slight droughtiness is the main limitation. Providing a regular supply of organic matter, maintaining fertility, and preserving a favorable tilth are other concerns.

These soils are suited to crops commonly grown in the area and are used mainly for corn, soybeans, oats, wheat, and alfalfa harvested for hay. Other suitable uses are for permanent pasture, woodland, and wildlife habitat.

These soils can be farmed in a more intensive rotation if suitable measures are used to control erosion than if such measures are not applied.

CAPABILITY UNIT IIs-7

This unit consists of well drained and moderately well drained, nearly level soils of the Hebron, Saylesville, and Symerton series. These soils have a loamy surface layer and a loamy or clayey subsoil. All are slowly permeable and dry out slowly in spring and after a rain. Their natural fertility is moderate to high, and their available moisture capacity is high. The dark-colored soils have a higher organic-matter content than the other soils in the unit, and they are easier to keep in good tilth.

In managing the soils of this unit, the main concerns are supplying organic matter, maintaining good tilth, and keeping fertility at a high level.

These soils are suited to corn, soybeans, oats, wheat, vegetable crops, and plants grown for hay. They also can be used for permanent pasture, trees, and wildlife habitat.

The soils of this unit can be farmed in a more intensive rotation if the level of management is high than if it is only average.

CAPABILITY UNIT IIIe-1

In this unit are well-drained, sloping, loamy soils that are subject to severe erosion if they are cultivated and not protected. These soils are of the Fox, Griswold, Hochheim, McHenry, Miami, Ringwood, and Zurich series. Natural fertility is high, permeability is moderate to moderately slow, and the available moisture capacity is high. Nearly all of the soils are eroded. Reducing runoff and controlling erosion are the main concerns, but keeping the soils fertile, in good tilth, and well supplied with organic matter also is important.

The soils in this unit are suited to corn, wheat, oats, and alfalfa grown for hay. In addition, they can be used for permanent pasture, trees, and wildlife habitat.

In slowing runoff and reducing erosion, terraces and contour stripcropping are effective. If these practices are used and if waterways are installed, the rotation can safely include fewer years of hay than it can if such practices are not provided. Also, fields protected by erosion control measures are suitable for row cropping.

CAPABILITY UNIT IIIe-4

This unit consists of well-drained, nearly level and gently sloping, loamy soils on terraces. These soils are of the Boyer, Casco, Fox, and Lorenzo series. They are highly susceptible to erosion if used for crops and not protected, and some areas are eroded. Natural fertility is low, permeability is moderate, and the available moisture capacity is medium. The dark-colored soils in the unit contain more organic matter than the other soils, and they are easier to keep in good tilth.

The main limitations affecting use of the soils in this unit are excessive runoff, the risk of erosion, and droughtiness. Preserving good tilth, maintaining fertility, and providing an adequate amount of organic matter are other concerns.

In reducing runoff and checking erosion, terracing and contour stripcropping are effective. Under intensive management, including the use of terraces, waterways, and stripcropping, 1 year of a row crop can replace 1 year of hay in the rotation.

CAPABILITY UNIT IIIe-6

This unit consists of well-drained, sloping soils that have a loamy surface layer and a clayey subsoil. These soils are of the Hebron, Markham, Morley, Saylesville, and Varna series. They are highly erodible, and most of them are eroded. The soils have high natural fertility, moderately slow to slow permeability, and high to very high available moisture capacity. The dark-colored soils are higher in organic-matter content than the other soils in the unit, and they are more easily kept in good tilth.

Reducing runoff, controlling erosion, and increasing the intake of water are the main concerns of management. Also important are supplying organic matter, maintaining fertility, and preserving good tilth.

The soils of this unit are suited to corn, soybeans, wheat, oats, and alfalfa harvested for hay. Alfalfa grows well on these soils. Other satisfactory uses are permanent pasture, trees, and wildlife habitat.

Terraces and contour stripcropping are suitable practices that help to control erosion. If these measures are provided, along with waterways, the rotation can safely include 1 year of a row crop.

CAPABILITY UNIT IIIw-3

In this unit are somewhat poorly drained and poorly drained, nearly level and gently sloping, loamy soils of the Colwood, Darroch, and Mundelein series. These soils have severe limitations because of excess water. Natural fertility is moderate, permeability is moderate, and the available moisture capacity is high.

A seasonal high water table less than 3 feet below the surface is the main limitation that affects use and management of these soils. Other concerns are maintaining good tilth and keeping fertility at an adequate level.

If properly drained, the soils in this unit are well suited to corn, oats, wheat, and soybeans, though lodging is common in small grains. Red, Ladino, and alsike clovers are better suited legumes than alfalfa. The soils also are highly suitable for permanent pasture and wildlife habitat.

CAPABILITY UNIT IIIw-5

In this unit are moderately well drained Alluvial land and somewhat poorly drained or poorly drained, nearly level or gently sloping, loamy soils of the Aztalan, Fabius, Granby, Mussey, Wasepi, and Yahara series. Some of the soils have a clayey substratum.

The soils of this unit are subject to ponding or flooding and have a seasonal high water table less than 3 feet below the surface. Natural fertility is low, permeability is moderate to moderately rapid, and the available moisture capacity is high.

In using and managing these soils, excess water is the main limitation. Preserving good tilth and maintaining fertility are other concerns.

If properly drained, these soils are well suited to corn, oats, wheat, and soybeans. They also can be used for permanent pasture and wildlife habitat. Under intensive management, row crops can be grown continuously.

CAPABILITY UNIT IIIw-9

In this unit are very poorly drained, nearly level organic soils of the Houghton, Ogden, and Palms series. These mucky soils have low natural fertility, moderate permeability, and very high available moisture capacity. The main limitations are ponding and a seasonal high water table less than 1 foot below the surface. Other concerns are the control of soil blowing, preventing subsidence in drained areas, and maintaining fertility. These soils are deficient in phosphorus and potassium.

The soils in this unit are well suited to vegetable crops, corn, soybeans, and plants produced for sod. They also can be used for wildlife habitat.

Wind stripcropping or windbreaks at right angles to the prevailing wind will help to control soil blowing. If the soils are intensively managed, properly drained, and kept from blowing, they can be safely used for row crops continuously.

CAPABILITY UNIT IVe-1

This unit consists of moderately steep, eroded soils that are loamy and well drained. These soils are of the Hochheim and Miami series. They are subject to severe erosion if they are cultivated and not protected. Natural fertility is low to moderate, permeability is moderate to moderately slow, and the available moisture capacity is medium. Reducing runoff and controlling erosion are the main concerns of management, but supplying organic matter, improving tilth, and maintaining fertility also are important.

The soils in this unit are suited to wheat, oats, corn, alfalfa, and plants grown for permanent pasture. They also can be used as woodland and wildlife habitat.

Terraces and contour stripcropping are suitable practices that help to check soil losses. If erosion control measures are provided, 1 year of a row crop can be safely added to the rotation.

CAPABILITY UNIT IVe-4

In this unit are well-drained, sloping soils that are highly susceptible to erosion if they are cropped and not protected. These soils are of the Boyer, Casco, Miami, and Rodman series. Some of them are eroded. All have low natural fertility, moderate permeability, and medium available moisture capacity. The dark-colored soils have a higher organic-matter content than the other soils, and they are easier to maintain in good tilth.

In using and managing the soils of this unit, the main limitations are excessive runoff, the erosion hazard, and droughtiness. Maintaining fertility, improving tilth, and providing an adequate amount of organic matter are other concerns.

These soils are suited to corn, wheat, soybeans, oats, and alfalfa grown for hay. They also can be used for permanent pasture, trees, and wildlife habitat.

Contour stripcropping is a suitable practice that helps to control erosion. If the soils are stripcropped and are intensively managed, they can be farmed in a rotation that includes row crops.

CAPABILITY UNIT IVe-6

This unit consists of well-drained, sloping and moderately steep, loamy soils of the Morley series. These soils have a clayey subsoil. They are highly susceptible to erosion, and most of them are eroded or severely eroded. Natural fertility is high, permeability is moderately slow, and the available moisture capacity is high. In using and managing the soils of this unit, the chief limitations are the risk of erosion and the slow intake of water. Supplying organic matter, maintaining fertility, and preserving good tilth are other concerns.

These soils are suited to soybeans, wheat, oats, alfalfa, and plants grown for permanent pasture. They also can be used as woodland and as habitat for wildlife.

Contour stripcropping is effective in slowing runoff and reducing erosion. If management is intensive, small grains can be safely added to the crop rotation.

CAPABILITY UNIT IVw-7

This unit consists of very poorly drained, nearly level, organic soils of the Adrian and Rollin series. These soils are subject to ponding and have a seasonal high water table less than 1 foot below the surface. Natural fertility is low, permeability is moderate, and the available moisture capacity is medium to high.

Excess water is a severe limitation that affects use of these soils for cultivated crops. Other concerns are the control of soil blowing, improving fertility, locating an outlet for drains, and preventing excessive shrinkage in drained areas. The soils are easily cultivated if they are properly drained.

These soils are well suited to vegetable crops, corn, soybeans, and plants grown for sod. In addition, they can be used as wildlife habitat.

Windbreaks at right angles to the prevailing wind help to control soil blowing. If the soils are drained, protected from wind damage, and intensively managed, they can be used for row crops continuously.

CAPABILITY UNIT IVs-3

The only soil in this unit is Boyer loamy sand, 1 to 6 percent slopes. This well-drained soil is droughty. It has low natural fertility, moderately rapid permeability, and medium available moisture capacity. Conserving moisture is the main concern, but controlling erosion, supplying organic matter, and maintaining fertility also are important in management.

The soil in this unit is suited to corn, wheat, soybeans, oats, and alfalfa grown for hay. It also is highly suitable for permanent pasture, as woodland, and as wildlife habitat.

In areas that are intensively managed, the rotation can safely include more years of row crops and fewer years of hay than in areas where management is only average. Contour stripcropping is a suitable practice that helps to control erosion in gently sloping areas.

CAPABILITY UNIT Vw-14

In this unit are Wet alluvial land and poorly drained, nearly level soils of the Muskego and Sawmill series. These soils are too wet for cultivation, and protecting them from flooding or improving drainage adequately for tilled crops is generally not feasible. Among the suitable uses are permanent pasture, woodland, and wildlife habitat.

CAPABILITY UNIT VIe-4

This unit consists of moderately steep, well-drained, loamy soils of the Casco, Miami, and Rodman series. Most of these soils are eroded. All of them are subject to severe erosion and generally are not suitable for cultivation. Natural fertility is low, permeability is moderate, and the available moisture capacity is medium.

These soils are suitable for permanent pasture, trees, and wildlife habitat. Where they are used for pasture, controlling grazing and renovating the sod will help to maintain a desirable plant cover and check erosion. Wooded areas should be protected from fire and grazing.

CAPABILITY UNIT VIe-6

In this unit are moderately steep and steep, well-drained Morley soils that have a clayey subsoil. These soils are highly susceptible to erosion, and some of them are severely eroded. Natural fertility is moderate, permeability is moderately slow, and the available moisture capacity is high.

Generally, the soils in this unit are too steep and too erodible for cultivation. They are suitable for permanent pasture, woodland, and wildlife habitat. In areas used for pasture, a good cover can be maintained by controlling grazing and renovating the sod. Woodland needs protection from fire and grazing.

CAPABILITY UNIT VIIs-5

This unit consists of steep, excessively drained and well-drained, loamy soils of the Casco and Rodman series. These soils are droughty and highly erodible. They have very low to low natural fertility, moderate to rapid permeability, and medium available moisture capacity. Plant roots generally penetrate to a depth of only 20 inches or less.

The soils in this unit are not suited to cultivated crops, but they can be used for permanent pasture, trees, and wildlife habitat. Conserving water and controlling erosion are the main concerns of management. Where the soils are used for pasture, a good cover of sod can be fostered by carefully managing grazing and by renovation. Livestock should be kept out of wooded areas, and fires should be prevented.

CAPABILITY UNIT VIIIs-10

In this unit are land types consisting of bare or nearly bare, infertile soil materials that are very droughty or subject to flooding. These mapping units are made up of beach sand that lies in narrow bands along the shore of Lake Michigan; steep or very steep areas near the lake and close to streams; and manmade cuts and fills in areas of loamy, clayey, or sandy material.

Generally, the land in this unit is not suitable for commercial plant production. Establishing a vegetative cover is difficult, and all plants now growing should be protected. Among the suitable uses are wildlife habitat and scenic areas overlooking Lake Michigan.

CAPABILITY UNIT VIIIw-15

Only Marsh is in this unit. This land type generally occurs close to streams and inland lakes. It is flooded most of the year and is very poorly drained. The vegetation consists mainly of cattails, bulrushes, and other water-tolerant plants.

Marsh is not suitable for pasture or woodland, but it can be used for wildlife or recreation. In most places ditching improves the habitat for waterfowl, muskrats, and other kinds of wildlife.

Predicted Yields

Table 1 gives predicted average yields per acre for the crops commonly grown in Kenosha and Racine Counties. The predictions are based on interviews with farmers, on results obtained by the agricultural experiment station on experimental test plots, and on observations made by soil scientists and other farm workers who are familiar with the soils and crops of the counties. Irrigation has not been considered in these predictions.

In the future, new techniques may increase the average yields over those shown, but little or no change is likely in the relative response of the different soils. Not listed in the table are Alluvial land, Casco-Rodman complex, 20 to 35 percent slopes, Clayey land, Loamy land, Marsh, Rollin muck, Rough broken land, Sandy and gravelly land, Sandy lake beaches, and Wet alluvial land.

The yields given in table 1 are for two levels of management. In columns A are the yields that can be expected on soils where the level of management is average. Under this management, lime and fertilizer are applied but in too small amounts; in areas where excess water is a limitation, drainage is not improved enough for optimum yields; seedbeds are prepared inadequately or at a time when the soil is too wet or too dry; erosion is not properly controlled; and there is little control of insect pests and weeds.

Yields shown in columns B are predicted for the best management practical on the soils. These yields represent about what can be expected from management based on present knowledge, methods, equipment, and crop varieties. Among the practices needed are the following:

1. Applying lime and fertilizer as indicated by soil tests, taking into consideration the kind of soil, the cropping history of the field, and the crop to be grown.
2. Providing adequate drainage and, where needed, protection from flooding.
3. Using timely and adequate methods of preparing seedbeds and planting crops.
4. Harvesting crops carefully and at the right time.
5. Installing and maintaining practices needed to control erosion.
6. Controlling weeds and harmful insects.

For renovated pasture the yields are about the same as those listed for alfalfa-brome hay. The highest yields of hay are obtained if the forage is cut and fed while green.

Recreational Uses of Soils

Recreation is becoming increasingly important in Kenosha and Racine Counties. To assist in planning the use of soils for this purpose, the soils of the two counties have been placed in nine recreation groups, which are described later in this subsection. Each group is made

TABLE 1.—*Predicted average acre yields of principal crops under two levels of management*

[Predicted yields in columns A are those obtained under average management; predicted yields in columns B are those obtained under improved, or a high level of, management. Absence of a yield figure indicates that the soil is not suited to the crop, or that the crop is not ordinarily grown on the soil]

Soil	Corn				Oats		Alfalfa-brome hay [1] (dry weight)	
	Grain		Silage					
	A	B	A	B	A	B [2]	A	B
	Bu.	*Bu.*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*
Adrian muck			12	17				
Ashkum silty clay loam, 0 to 3 percent slopes	70	100	12	17	50	65		4.0
Aztalan loam, 0 to 2 percent slopes	65	105	11	17	50	60	2.5	4.5
Aztalan loam, 2 to 6 percent slopes	65	105	11	17	50	60	2.5	4.5
Aztalan sandy loam, 1 to 3 percent slopes	65	100	11	17	50	60	2.5	4.5
Beecher silt loam, 1 to 3 percent slopes	65	100	12	17	50	70	3.0	4.5
Blount silt loam, 1 to 3 percent slopes	65	100	12	17	50	65	2.5	4.0
Boyer loamy sand, 1 to 6 percent slopes	45	65	8	11	35	50	1.5	2.5
Boyer loamy sand, 6 to 12 percent slopes, eroded	40	60	7	10	30	45	1.0	2.0
Boyer sandy loam, 2 to 6 percent slopes	35	70	9	12	40	55	1.5	2.5
Casco loam, 2 to 6 percent slopes	50	70	8	12	40	55	1.5	2.5
Casco loam, 2 to 6 percent slopes, eroded	45	65	7	10	35	50	1.0	2.0
Casco loam, 6 to 12 percent slopes, eroded	35	55	5	7	25	40	1.0	1.5
Casco loam, 12 to 20 percent slopes, eroded					20	30	1.0	1.5
Casco sandy loam, 2 to 6 percent slopes	50	65	8	11	30	45	1.5	2.5
Casco sandy loam, 6 to 12 percent slopes, eroded	40	55	6	8	25	40	1.0	2.0
Casco-Miami loams, 6 to 12 percent slopes:								
Casco	45	65	7	11	40	55	1.5	2.5
Miami	65	90	11	15	55	70	2.5	4.0
Casco-Miami loams, 12 to 20 percent slopes:								
Casco					35	50	1.0	2.0
Miami					50	65	2.0	3.5
Casco-Rodman complex, 6 to 12 percent slopes:								
Casco	45	65	7	11	40	55	1.5	2.5
Rodman					25	40	1.0	2.0
Casco-Rodman complex, 12 to 20 percent slopes, eroded:								
Casco					20	30	1.0	1.5
Rodman								
Colwood silt loam	65	90	12	16	45	60		4.0
Conover silt loam, 1 to 3 percent slopes	75	110	12	17	55	65	2.5	4.0
Darroch fine sandy loam, neutral variant, 0 to 3 percent slopes	70	95	12	16	45	65	3.0	4.0
Dorchester silt loam [3]	80	110	13	18	50	70	3.5	4.5
Dresden loam, 1 to 3 percent slopes	50	80	9	13	45	60	2.5	3.0
Drummer silt loam, gravelly substratum	70	110	12	18	45	65		4.0
Elliott silty clay loam, 0 to 2 percent slopes	65	100	12	17	50	65	2.5	4.0
Elliott silty clay loam, 2 to 6 percent slopes	65	100	12	17	50	65	2.5	4.0
Fabius loam, 1 to 3 percent slopes	55	80	9	13	40	55	2.0	3.0
Fox loam, 0 to 2 percent slopes	50	80	9	13	45	60	2.5	3.0
Fox loam, 2 to 6 percent slopes	50	80	9	13	45	60	2.5	3.0
Fox loam, 6 to 12 percent slopes, eroded	40	70	7	11	35	50	2.0	2.5
Fox loam, clayey substratum, 0 to 2 percent slopes	50	80	9	13	45	60	2.5	3.0
Fox loam, clayey substratum, 2 to 6 percent slopes	50	80	9	13	45	60	2.5	3.0
Fox sandy loam, 1 to 6 percent slopes	50	70	8	12	40	55	2.0	2.5
Fox sandy loam, 6 to 12 percent slopes, eroded	45	65	7	10	35	50	1.5	2.0
Fox silt loam, 0 to 2 percent slopes	60	85	10	14	50	65	2.5	3.5
Fox silt loam, 2 to 6 percent slopes	60	85	10	14	40	55	2.5	3.5
Granby fine sandy loam	45	65	8	11	40	50		3.0
Granby fine sandy loam, loamy substratum	45	65	8	11	40	50		3.0
Granby fine sandy loam, brown subsoil variant, 0 to 3 percent slopes	40	55	7	9	35	55	1.5	2.5
Griswold loam, 2 to 6 percent slopes	70	90	12	15	50	60	2.5	3.5
Griswold loam, 6 to 12 percent slopes, eroded	60	80	10	12	45	50	2.0	3.0
Hebron loam, 0 to 2 percent slopes	80	110	12	17	55	70	3.0	4.5
Hebron loam, 2 to 6 percent slopes, eroded	70	100	10	15	50	60	2.5	4.0
Hebron loam, 6 to 12 percent slopes, eroded	60	90	9	13	45	50	2.0	3.0
Hebron sandy loam, 2 to 6 percent slopes	75	100	12	17	45	60	3.0	4.0
Hochheim loam, 2 to 6 percent slopes	75	100	12	17	55	70	3.0	4.5
Hochheim loam, 6 to 12 percent slopes, eroded	65	90	11	15	50	65	2.5	4.0
Hochheim loam, 12 to 20 percent slopes, eroded	55	80	9	13	45	60	2.0	3.5
Houghton muck			15	19				
Kane loam, 1 to 3 percent slopes	80	100	13	17	45	65	2.5	3.5
Kane silt loam, clayey substratum, 1 to 3 percent slopes	80	100	13	17	45	65	2.5	3.5
Knowles silt loam, 2 to 6 percent slopes	60	85	10	14	50	70	2.5	3.5
Lawson silt loam, calcareous variant [3]	70	110	12	18	45	65	2.0	4.0
Lorenzo loam, 2 to 6 percent slopes	50	75	8	12	40	55	2.5	1.5
Markham silt loam, 2 to 6 percent slopes	65	100	12	17	50	70	3.0	4.5
Markham silt loam, 2 to 6 percent slopes, eroded	55	90	10	13	40	60	3.0	4.5

TABLE 1.—*Predicted average acre yields of principal crops under two levels of management*—Continued

Soil	Corn				Oats		Alfalfa-brome hay [1] (dry weight)	
	Grain		Silage					
	A	B	A	B	A	B [2]	A	B
	Bu.	*Bu.*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*
Markham silt loam, 6 to 12 percent slopes, eroded	55	90	10	13	40	60	3.0	4.0
Martinton silt loam, 1 to 3 percent slopes	70	105	12	17	50	65	3.0	4.5
Matherton loam, 1 to 3 percent slopes	65	90	11	15	45	60	2.5	3.5
Matherton loam, clayey substratum, 1 to 3 percent slopes	65	90	11	15	45	60	2.5	3.5
McHenry silt loam, 2 to 6 percent slopes	70	100	12	16	55	70	3.0	4.5
McHenry silt loam, 6 to 12 percent slopes, eroded	65	90	11	15	50	65	2.5	3.5
Miami loam, 2 to 6 percent slopes	70	100	12	16	55	70	3.0	4.5
Miami loam, 6 to 12 percent slopes, eroded	60	85	10	13	45	60	2.0	3.0
Miami loam, 12 to 20 percent slopes, eroded	55	80	9	12	40	55	1.5	2.5
Miami loam, sandy loam substratum, 2 to 6 percent slopes	70	95	12	16	60	70	3.0	4.0
Miami loam, sandy loam substratum, 6 to 12 percent slopes, eroded	60	80	10	13	45	60	2.0	3.0
Miami loam, sandy loam substratum, 12 to 20 percent slopes, eroded	50	70	8	11	35	50	1.5	2.5
Miami silt loam, 2 to 6 percent slopes	80	110	13	17	60	70	3.0	4.5
Miami silt loam, 6 to 12 percent slopes, eroded	60	85	10	13	45	60	2.0	3.0
Montgomery silty clay	65	100	11	17	40	60	----	4.0
Morley silt loam, 2 to 6 percent slopes	65	100	12	17	50	70	3.0	4.5
Morley silt loam, 2 to 6 percent slopes, eroded	55	90	8	13	40	60	2.5	3.5
Morley silt loam, 6 to 12 percent slopes	55	90	8	13	40	60	2.5	3.5
Morley silt loam, 6 to 12 percent slopes, eroded	50	85	7	10	35	55	2.0	3.0
Morley silt loam, 12 to 20 percent slopes	50	85	7	10	35	55	2.0	3.0
Morley silt loam, 12 to 20 percent slopes, eroded	45	65	5	8	30	50	1.5	2.5
Morley silt loam, 20 to 30 percent slopes	----	----	----	----	30	50	1.5	2.0
Morley soils, 6 to 12 percent slopes, severely eroded	45	60	5	8	30	50	1.5	2.0
Morley soils, 12 to 20 percent slopes, severely eroded	----	----	----	----	30	50	1.5	2.0
Mundelein silt loam, 1 to 3 percent slopes	70	100	12	17	45	65	3.0	4.5
Muskego muck	----	----	15	19	----	----	----	----
Mussey loam	55	80	9	13	40	55	----	2.5
Navan silt loam	65	90	12	16	45	60	----	4.0
Ogden muck	----	----	15	19	----	----	----	----
Palms muck	----	----	15	19	----	----	----	----
Pella silt loam	75	115	12	18	55	65	----	4.0
Plano silt loam, gravelly substratum	70	110	12	18	45	65	----	4.0
Radford silt loam, 0 to 3 percent slopes	70	105	12	16	50	75	3.0	4.0
Ringwood silt loam, 2 to 6 percent slopes	80	100	13	17	55	70	3.0	4.5
Ringwood silt loam, 6 to 12 percent slopes	75	95	12	16	50	65	2.5	4.0
St. Charles silt loam, gravelly substratum, 0 to 2 percent slopes	80	115	12	18	60	75	3.0	4.5
St. Charles silt loam, gravelly substratum, 2 to 6 percent slopes	80	115	12	18	60	75	3.0	4.5
Sawmill silt loam, calcareous variant [3]	----	110	----	18	----	----	----	----
Saylesville silt loam, 0 to 2 percent slopes	65	85	12	14	50	70	3.0	4.5
Saylesville silt loam, 2 to 6 percent slopes	65	85	12	14	50	70	3.0	4.5
Saylesville silt loam, 6 to 12 percent slopes, eroded	55	75	10	12	40	60	2.5	3.5
Saylesville silt loam, dark surface variant, 0 to 2 percent slopes	80	105	13	17	55	70	3.0	4.5
Saylesville silt loam, dark surface variant, 2 to 6 percent slopes	80	105	13	17	55	70	3.0	4.5
Sebewa silt loam	65	90	11	15	45	65	----	4.0
Sebewa silt loam, clayey substratum	65	90	11	15	45	65	----	4.0
Sisson fine sandy loam, 1 to 6 percent slopes	70	95	12	16	50	70	3.0	4.5
Sisson fine sandy loam, clayey substratum, 1 to 6 percent slopes	70	95	12	16	50	70	3.0	4.5
Symerton loam, 0 to 2 percent slopes	80	105	13	17	55	70	3.0	4.5
Symerton loam, 2 to 6 percent slopes	80	105	13	17	55	70	3.0	4.5
Theresa silt loam, 2 to 6 percent slopes	70	100	12	16	50	65	2.5	4.5
Varna silt loam, 2 to 6 percent slopes	70	100	12	17	50	70	3.0	4.5
Varna silt loam, 2 to 6 percent slopes, eroded	60	90	10	15	40	60	2.5	4.0
Varna silt loam, 6 to 12 percent slopes, eroded	55	85	10	15	40	60	2.0	3.5
Wallkill silt loam	80	105	13	17	40	60	----	----
Warsaw loam, 0 to 2 percent slopes	70	95	12	16	55	70	2.5	3.5
Warsaw loam, 2 to 6 percent slopes	65	90	11	15	50	65	2.5	3.5
Warsaw loam, clayey substratum, 0 to 2 percent slopes	70	95	12	16	55	70	2.5	3.5
Warsaw loam, clayey substratum, 2 to 6 percent slopes	70	95	12	16	55	70	2.5	3.5
Warsaw silt loam, 0 to 2 percent slopes	65	90	11	15	50	65	2.5	3.5
Warsaw silt loam, 2 to 6 percent slopes	65	90	11	15	50	65	2.5	3.5
Wasepi sandy loam, 1 to 3 percent slopes	60	85	11	14	40	50	2.0	3.0
Wasepi sandy loam, clayey substratum, 1 to 3 percent slopes	60	85	11	14	40	50	2.0	3.0
Worthen silt loam, 0 to 3 percent slopes	75	105	12	17	55	70	3.5	4.5
Yahara fine sandy loam, 1 to 3 percent slopes	60	90	10	15	45	65	2.5	4.0
Zurich silt loam, 0 to 2 percent slopes	70	95	12	16	50	70	3.0	4.5
Zurich silt loam, 2 to 6 percent slopes	70	95	12	16	50	70	3.0	4.5
Zurich silt loam, 6 to 12 percent slopes, eroded	60	85	10	14	45	65	2.5	4.0

[1] Yields are for hay cut from first- or second-year stands.

[2] Yields are for oats seeded with a grass-legume mixture.

[3] Yields are for areas of this soil that are protected from flooding.

up of soils that have similar limitations affecting their use and that require similar management.

Facilities of outdoor recreation that depend a great deal on soil properties are playgrounds, athletic fields, and other intensive play areas; picnic areas, parks, and other extensive play areas; bridle paths, nature trails, and hiking trails; golf fairways; cottages, service buildings, and utility buildings; and tent sites and camp trailer sites.

For the soils in each recreation group, the degree and kind of limitations are given for specified recreational uses. The limitations are rated slight, moderate, severe, or very severe. Some of the soil properties that affect the use of soils for recreation are texture, permeability, slope, depth to bedrock, wetness, and the hazards of erosion and flooding. The ratings are general, and onsite investigation is needed for detailed planning and orderly development of recreational facilities.

A rating of *slight* means that the soils are free of limitations or have limitations for a given use that are easy to overcome. A rating of *moderate* indicates that the soils have limitations for a given use that can be overcome by average management and careful design. A rating of *severe* means that the soils have limitations for a given use that are difficult to overcome. This rating for a particular use, however, does not imply that soils so rated cannot be put to that use. A rating of *very severe* indicates that the soils have limitations that generally preclude use for a given purpose.

Not considered in the ratings are the esthetic qualities of a specific area, the site and shape of areas occupied by a specific soil, and the pattern that these areas form with areas of other soils in the landscape. Nevertheless, all of these features may be important in selecting a site. The ratings also do not apply to severely eroded soils but are for soils that range from not eroded through moderately eroded. In general, limitations for severely eroded soils are more restricting than for similar but less eroded soils.

The ratings for the poorly drained soils are for soils in their natural state without adequate drainage. If their drainage is improved, these soils can be used for one or more kinds of recreational development.

In the following pages the nine recreation groups of Kenosha and Racine Counties are discussed. To find the names of the soils in any given group, refer to the "Guide to Mapping Units" at the back of this survey.

RECREATION GROUP 1

This group consists of well drained and moderately well drained soils that have a surface layer of loam or silt loam. These soils are limited by excess water in only a few places, and generally they are highly suitable for farming. Slopes range from 0 to 20 percent. Some of the soils are eroded.

The soils in this group are well suited to many kinds of plants, and they can produce a good sod that withstands heavy foot traffic. Extensive leveling exposes the substratum, however, and this layer cannot support sod of sufficient quality to withstand such traffic. The surface of these soils stays wet and soft after a rain, and unvegetated areas are slippery and muddy and readily compacted when wet. Commonly, they are very dusty when dry. Erosion is a hazard in sloping areas.

The limitations for various recreational uses are as follows:

For playgrounds, athletic fields, and other intensive play areas, slight on slopes of 0 to 2 percent, moderate on slopes of 2 to 6 percent, and severe on slopes of more than 6 percent.

For picnic areas, parks, and other extensive play areas, slight on slopes of 0 to 6 percent, moderate on slopes of 6 to 12 percent, and severe on slopes of more than 12 percent.

For bridle paths, nature trails, and hiking trails, moderate on slopes of 0 to 12 percent and severe on slopes of more than 12 percent. Trails and paths in sloping areas are less likely to erode if they are placed on the contour.

For golf fairways, slight on slopes of 0 to 6 percent, moderate on slopes of 6 to 12 percent, and severe on slopes of more than 12 percent.

For cottages, service buildings, and utility buildings, slight on slopes of 0 to 6 percent, moderate on slopes of 6 to 12 percent, and severe on slopes of more than 12 percent. These soils are not subject to flooding, and they are suitable for absorbing effluent from domestic sewage disposal systems.

For tent sites and camp trailer sites, moderate on slopes of 0 to 6 percent and severe on slopes of more than 6 percent. Walks and roads may need surfacing.

RECREATION GROUP 2

In this group are well drained and moderately well drained soils that have a surface layer of sandy loam to silt loam. These soils are limited by excess water in only a few places, and they are well suited to many kinds of grasses, shrubs, trees, and other plants. Slopes range from 0 to 35 percent. Some of the soils are eroded, and one of them is underlain by dolomite bedrock within 40 inches of the surface.

The soils in this group can produce a good turf that withstands heavy foot traffic. If leveling is extensive, however, the substratum is exposed, and this layer generally cannot support a good turf. In addition, the depth of cuts made in leveling is limited in areas where dolomite bedrock is near the surface. Sloping areas are erodible, and areas having a silt loam surface layer are muddy and slippery when wet.

The limitations for various recreational uses are as follows:

For playgrounds, athletic fields, and other intensive play areas, slight on slopes of 0 to 2 percent, moderate on slopes of 2 to 6 percent, and severe on slopes of more than 12 percent.

For bridle paths, nature trails, and hiking trails, slight on slopes of 0 to 12 percent, moderate on slopes of 12 to 20 percent, and severe on slopes of more than 20 percent. Placing trails and paths on the contour lessens the risk of erosion.

For golf fairways, slight on slopes of 0 to 6 percent, moderate on slopes of 6 to 12 percent, and severe on slopes of more than 12 percent.

For cottages, service buildings, and utility buildings, slight on slopes of 0 to 6 percent, moderate on slopes of 6 to 12 percent, and severe on slopes of more than 12

percent. Except in areas where dolomite bedrock is near the surface, the soils of this group are suitable for absorbing effluent from domestic sewage disposal systems. Where bedrock is within 40 inches of the surface, the use of these systems is restricted and may contaminate the ground water.

For tent sites and camp trailer sites, slight on slopes of 0 to 6 percent, moderate on slopes of 6 to 12 percent, and severe on slopes of more than 12 percent.

RECREATION GROUP 3

This group consists of moderately well drained soils that developed in fine-textured materials. These soils have a surface layer that is mainly silt loam but in small areas is loam or silty clay loam. They are desirable soils for farming, but most of their acreage is within or near large areas of industry and housing. Slopes range from 0 to 30 percent. Some of the soils are eroded or severely eroded.

The soils in this group are well suited to many kinds of plants, and they can produce a firm sod that withstands heavy foot traffic. Because their permeability is moderately slow to slow, however, the soils stay wet for short periods after rain, and unvegetated areas are muddy and slippery and readily compacted when wet. Commonly, the soils are very dusty when dry. Erosion is a hazard in sloping areas.

The limitations for various recreational uses are as follows:

For playgrounds, athletic fields, and other intensive play areas, moderate on slopes of 0 to 6 percent and severe on slopes of more than 6 percent.

For picnic areas, parks, and other extensive play areas, slight on slopes of 0 to 6 percent, moderate on slopes of 6 to 12 percent, and severe on slopes of more than 12 percent. Figure 4 shows a farm pond and adjoining areas that are used for several kinds of recreation.

For bridle paths, nature trails, and hiking trails, moderate on slopes of 0 to 6 percent and severe on slopes of more than 6 percent. Paths and trails may need surfacing in some places.

For golf fairways, slight on slopes of 0 to 6 percent, moderate on slopes of 6 to 12 percent, and severe on slopes of more than 12 percent.

Figure 4.—A farm pond, properly designed and constructed, that provides recreation and erosion control.

For cottages, service buildings, and utility buildings, severe on all slopes from 0 to 30 percent. Because the soils have moderately slow to slow permeability, they sometimes cannot absorb effluent rapidly enough to permit the satisfactory operation of domestic sewage disposal systems. Foundations may crack or shift, for the soils swell when wet and shrink as they dry. Bare areas around buildings are muddy and slippery when wet.

For tent sites and camp trailer sites, moderate on slopes of 0 to 6 percent and severe on slopes of more than 6 percent. Surfacing of walks and roads is desirable in most places.

RECREATION GROUP 4

This group is made up of coarse-textured, excessively drained soils that developed on deep, sandy outwash plains in the western part of Kenosha and Racine Counties. These soils are droughty, have only medium available water capacity, and are low in natural fertility. Slopes range from 1 to 12 percent. Some areas are eroded.

On the soils of this group, maintaining a good turf that will withstand heavy foot traffic is difficult, especially in dry periods. The only suitable plants are those that can grow on droughty soils. Extensive leveling may expose the sandy substratum, and this layer is even less capable of supporting a satisfactory plant cover. Soil blowing is likely in places where the surface is left unprotected, and water erosion is a hazard in sloping areas. Because the soils are unstable, they become loose and soft if used for paths, trails, and roads.

Limitations are moderate if these soils are used for playgrounds, athletic fields, and other intensive play areas; for picnic areas, parks, and other extensive play areas; for bridle paths, nature trails, and hiking trails; for cottages, service buildings, and utility buildings; and for tent sites and camp trailer sites.

Limitations are severe for golf fairways.

RECREATION GROUP 5

This group consists of soils that have a surface layer of sandy loam to silt loam and generally are somewhat poorly drained. Slopes range from 0 to 6 percent. One of the soils is moderately well drained but is subject to occasional overflow.

The soils in this group have a seasonal high water table and must be drained if the best use is to be made of them. They can produce a good sod, and many kinds of moisture- and water-tolerant plants grow well, but the vegetation is damaged if foot traffic is heavy when the surface layer is wet. In places where a plant cover is poor or lacking, the soils are slippery and muddy after a rain, and those having a silt loam surface layer are readily compacted. Walks, roads, and trails commonly need surfacing.

Limitations are moderate if these soils are used for playgrounds, athletic fields, and other intensive play areas; for picnic areas, parks, and other extensive play areas; for bridle paths, nature trails, and hiking trails; for golf fairways; and for tent sites and camp trailer sites.

Limitations are very severe for cottages, service buildings, and utility buildings. In spring, as well as during and after prolonged or heavy rainfall, domestic systems for disposing of sewage are inoperative when they are flooded by high ground water. The turf around buildings is easily damaged if the soils are wet.

RECREATION GROUP 6

In this group are poorly drained soils that have a high water table much of the year. The surface layer of these soils ranges from silty clay to fine sandy loam. Slopes are 0 to 3 percent.

These soils must be drained if the best use is to be made of them, but even after drainage is improved, they remain wet for long periods after rain. The soils having a surface layer of silt loam, silty clay loam, or silty clay are readily compacted when wet. Consequently, sod is easily damaged and heavily traveled areas commonly become muddy and slippery if they are not protected by a good turf. Sod-forming plants do well, but the only suitable ones are those that can grow in wet soils. Trails, paths, and roads that are heavily traveled generally need surfacing.

Limitations are severe if these soils are used for playgrounds, athletic fields, and other intensive play areas; for picnic areas, parks, and other extensive play areas; for bridle paths, nature trails, and hiking trails; for golf fairways; and for tent sites and camp trailer sites.

Limitations are very severe for cottages, service buildings, and utility buildings. Domestic systems for disposing of sewage are inoperative much of the year when they are flooded by high ground water. Areas around buildings remain wet a large part of the time.

RECREATION GROUP 7

This group consists of somewhat poorly drained and poorly drained soils that formed in alluvial material at the foot of upland slopes and on bottom land along streams. Slopes range from 0 to 3 percent.

These soils are subject to flooding and stay wet much of the year. Unless they are protected from floodwater, they are likely to receive additional deposits of alluvial material from time to time. Even if drainage is improved, excess water is a limitation for long periods after rain. If the soils are subjected to heavy foot traffic when wet, they become muddy and slippery and are readily compacted. In areas that are protected from further deposition, a good sod can be established but is easily damaged. The only suitable plants are those that can grow in wet soils.

Limitations are moderate if these soils are used for bridle paths, nature trails, and hiking trails. Surfacing of paths and trails is needed in many areas.

Limitations are severe for playgrounds, athletic fields, and other intensive play areas; for picnic areas, parks, and other extensive play areas; for golf fairways; and for tent sites and camp trailer sites.

Limitations also are severe for cottages, service buildings, and utility buildings. Domestic systems for disposing of sewage are inoperative when the water table is high or when the soils are flooded. These soils liquefy readily if wet and are subject to frost heave. Consequently, cracking and shifting are hazards to foundations. Roads and trails generally need to be paved.

RECREATION GROUP 8

This group consists of very poorly drained organic soils that lie in old lakebeds and along river bottoms. These mucky soils have a high water table most of the year. They cannot withstand heavy foot traffic when wet and are dusty when dry. Even if drained, they remain wet for long periods after rain. The soils are likely to shrink as they dry, and there are large cracks in some places. Trafficability is poor, and sod is easily damaged. The only suitable plants are those that can grow in organic soils.

Limitations are severe if these soils are used for golf fairways.

Limitations are very severe for play grounds, athletic fields, and other intensive play areas; for picnic areas, parks, and other extensive play areas; for bridle paths, nature trails, and hiking trails; for cottages, service buildings, and utility buildings; and for tent sites and camp trailer sites. The soils have low bearing capacity, and foundations may crack or shift. Because the soils are unstable, anchoring tents with pins and stakes is difficult. Paths, trails, and roads are difficult to maintain, and they become soft and loose and are readily compacted. Roads and trails need surfacing, but even this may not keep them firm.

RECREATION GROUP 9

In this group are miscellaneous land types that differ widely in soil characteristics and relief. Some of these land types are so wet, so sandy, so compacted, or so steep and erodible that they are generally of little use for recreation. Others occur in areas that are too small or too intensively used for other purposes to support a desirable plant cover. Consequently, the limitations are severe or very severe for playgrounds, athletic fields, and other intensive play areas; for picnic areas, parks, and other extensive play areas; for bridle paths, nature trails, and hiking trails; for golf fairways; for cottages, service buildings, and utility buildings; and for tent sites and camp trailer sites.

Use of Soils for Wildlife

Wildlife in these counties is distributed differently today than it was in the days of the early settlers. The better drained soils on uplands are highly suitable for wildlife, but they have been cleared for crops in most places and stands of trees remain only in small woodlots. These are generally too small for deer and other big game, though most of them support some kinds of small mammals and upland game birds.

Most of the wildlife lives on wetlands and in the steeper wooded areas in the western part of the two counties. Deer are no longer found in the eastern part, where expanding industry and housing have changed or destroyed the natural habitat. And because the use of firearms is prohibited by law in eastern areas, here the population of small mammals and upland game birds has increased markedly.

Wildlife groups

The soils in Kenosha and Racine Counties have been placed in 12 groups according to their suitability for specified kinds of wildlife. These groups are described in the following pages. The kinds of wildlife are migratory waterfowl, including ducks and geese; furbearers, which include beaver, mink, and muskrat; upland game birds, such as grouse, quail, and pheasant; songbirds; small mammals, including rabbit and squirrel; and deer.

All the soils in one wildlife group respond in a similar way to about the same management. Also, they are similar with respect to the hazards and limitations that affect their use.

The limitations of the soils in each group are rated slight, moderate, severe, and very severe. A rating of *slight* indicates that the soils are nearly free of limitations or have limitations that are easily overcome. A rating of *moderate* shows that the soils can be readily used if well managed, but generally they are less productive than soils having only slight limitations. A rating of *severe* indicates that the soils are of only limited use to the kind of wildlife specified, and they have hazards or restrictions that are difficult to overcome. A rating of *very severe* means that the soils can provide little or none of the habitat required.

In evaluating use of the soils for wildlife, no consideration was given to the size and shape of soil areas or to the pattern that these areas form with those of other soils in the landscape. The kinds of wildlife that live in a given area and the number of each kind are closely related to land use, to the resulting kinds and patterns of vegetation, and to the availability of water. Because wild animals are mobile, they can make use of the most desirable habitat on a number of different soils. For example, an upland game bird may nest in one area, feed in another, and find protective cover in still another. A variety of soils within the home range of a species of wildlife normally provides the most productive habitat.

Discussed in the following pages are the 12 wildlife groups in these counties. It is not intended that the discussion will eliminate the need for evaluating the suitability of each site as wildlife habitat. Only the major limitations are described, and they are based on information presently available. To find the names of the soils in any given wildlife group, refer to the "Guide to Mapping Units" at the back of this survey.

WILDLIFE GROUP 1

This group consists of well drained or moderately well drained soils that are moderately coarse textured to moderately fine textured and have medium internal drainage. Slopes range from 0 to 30 percent. Most of these soils are well suited to crops, and their use for wildlife is generally limited to birds and mammals that can live in open areas and small woodlots. Some of the soils are eroded or severely eroded.

The soils in this group can produce a good growth of grain crops, seed crops, legumes, and wild herbaceous and woody plants. Many kinds of shrubs, vines, and mast and den trees grow well. Erosion, the main hazard, limits the use of steeper soils for grain and seed crops.

For use of these soils by migratory waterfowl and furbearers, limitations are moderate on slopes of 0 to 6 percent, severe on slopes of 6 to 12 percent, and very severe on slopes of more than 12 percent. These soils are not well suited to wetland food and cover plants, and a water habitat may be difficult to provide.

For use by upland game birds and songbirds, limitations are slight on slopes of 0 to 6 percent, moderate on slopes of 6 to 12 percent, severe on slopes of 12 to 20 percent, and very severe on slopes of more than 20 percent.

For use by small mammals and deer, limitations are slight on slopes of 0 to 12 percent, moderate on slopes of 12 to 20 percent, and severe on slopes of more than 20 percent.

WILDLIFE GROUP 2

This group consists of somewhat poorly drained soils that formed under a cover of trees and have slow internal drainage. Slopes range from 1 to 3 percent. Unless drained, these soils are too wet for some kinds of plants. A considerable acreage is cropped, but there are many small woodlots and some large areas used for woodland and wildlife.

Many kinds of shrubs, vines, and mast and den trees grow well on these soils, but improved drainage is needed for the best growth of grain crops, seed crops, grasses, and legumes. Although cover normally is not difficult to provide, occasional flooding is a hazard to birds and mammals that nest or bed on the ground.

Because excess water is a risk at times, limitations to the use of these soils by upland game birds are moderate.

Limitations to use by migratory waterfowl, furbearers, songbirds, small mammals, and deer are only slight. These soils can produce many species of wild herbaceous plants and woody plants. In most places small developments of shallow water are relatively easy to provide for migratory waterfowl, and the desired water level generally is not difficult to maintain. Wetland food and cover plants can be expected to grow well. As a rule, nesting boxes or trees are needed for wood ducks. In some places enough water is available to furnish suitable habitat for furbearing wildlife, but commonly it is difficult to maintain the water at a desired level.

WILDLIFE GROUP 3

This group is made up of moderately well drained soils that formed under prairie grasses. These soils are medium textured to moderately fine textured and have medium internal drainage. They are well suited to crops, and their use for wildlife is generally limited to birds and mammals that can live in open areas where trees are few and scattered. Slopes range from 0 to 12 percent. Some of the soils are eroded.

The soils in this group can produce a good growth of grain crops, seed crops, grasses, and legumes. Wild herbaceous food plants are naturally scarce or lacking, however, and wetland food and cover plants grow poorly. Although wild herbaceous and woody species must be planted in most areas, many suitable kinds grow well along fence rows, on the edges of fields, and in similar places. Erosion is a hazard in the more sloping areas that are cultivated.

For use of these soils by migratory waterfowl, limitations are moderate to severe on slopes of 0 to 6 percent and severe on slopes of 6 to 12 percent. Developing areas of shallow water is difficult.

For use by furbearers, limitations are moderate on slopes of 0 to 6 percent and severe on slopes of 6 to 12 percent. Because the supply of water is adequate and dependable in only a few places, a suitable water habitat generally cannot be provided on these soils.

For use by upland game birds, limitations are slight on slopes of 0 to 6 percent and moderate on slopes of 6 to 12 percent.

For use by songbirds, limitations are moderate on slopes of 0 to 6 percent and severe on slopes of 6 to 12 percent. Since few trees and thickets occur on these soils, most songbirds find suitable habitat only in vegetation that has been planted in fence rows and along field borders.

For use by small mammals and deer, limitations are moderate on all slopes from 0 to 12 percent. Shrubs, vines, and mast and den trees are lacking, except for scattered oaks. Consequently, there is no protective cover for deer unless it is available on soils nearby.

WILDLIFE GROUP 4

In this group are somewhat poorly drained soils that formed under a cover of water-tolerant grasses and have slow internal drainage. Slopes range from 0 to 6 percent. Most of the acreage of these soils is used for crops, and there are only a few scattered trees in some places.

Improved drainage is needed for the best growth of grain crops, seed crops, and legumes on these soils. Trees, shrubs, and vines generally are lacking, and they must be planted if woody species are desired for food and cover. Occasional flooding or ponding is a hazard to birds that nest on the ground.

Limitations to use of these soils by migratory waterfowl are only slight. Providing small developments of shallow water generally is relatively easy, and maintaining the water at a desired level usually is not difficult. Wetland food plants can be expected to grow well.

Limitations to use by furbearers, upland game birds, songbirds, and small mammals and deer are moderate. In some places enough water is available to furnish suitable habitat for furbearing wildlife, but commonly it is difficult to maintain the water at a desired level. A wide variety of aquatic plants can grow on these soils. Although wild herbaceous species must be planted in most areas, many suitable kinds grow well along fence rows, on the edges of fields, and in similar areas. The number of songbirds is limited mainly by the lack of enough trees and shrubs for nesting. Unless cover is available nearby, deer do not use the soils of this group. The general absence of trees keeps the squirrel population to a minimum.

WILDLIFE GROUP 5

This group consists of poorly drained soils that are wet most of the year. Although these soils are used for crops in some places, they are important to wildlife because a large acreage is wooded and used as wildlife habitat.

Improved drainage is needed for the best growth of grain crops, seed crops, and legumes on these soils. Many kinds of food and cover plants can be grown, but only a few species of woody plants do well because of excess water. Frequent flooding is a hazard to wildlife that nests or beds on the ground.

Limitations to use of these soils by migratory waterfowl and furbearers are only slight. Providing develop-

ments of shallow water generally is relatively easy, and maintaining water at the desired level is not difficult. The soils are well suited to wetland food and cover plants, and in most places a water habitat is easily provided for furbearers. Wood ducks generally need boxes or trees for nesting.

Limitations to use by upland game birds, songbirds, small mammals, and deer are moderate. Oak trees and den trees for squirrels are lacking in most places, and the burrows and nests of rabbits are frequently flooded. Deer cannot bed on these soils during wet periods.

WILDLIFE GROUP 6

The soils of this group are thin and medium textured or moderately coarse textured. They have only medium available moisture capacity and are droughty in dry periods. Slopes range from 2 to 35 percent. Some of the soils are eroded. Nearly all areas in which slopes exceed 12 percent are used as woodland and for wildlife.

The mildly sloping soils in this group are well suited to grain crops, seed crops, legumes, wild herbaceous plants, and woody plants, including mast trees and den trees. Where the soils are steeper, however, they are poorly suited to grain crops and seed crops and generally produce less cover and natural food. Erosion is a hazard in sloping areas that are cultivated.

For use of these soils by migratory waterfowl and furbearers, limitations are severe on slopes of 2 to 6 percent and very severe on slopes of more than 6 percent. Areas of open water are difficult to provide, and wetland food and cover plants grow poorly.

For use by upland game birds and songbirds, limitations are slight on slopes of 2 to 6 percent, moderate on slopes of 6 to 12 percent, severe on slopes of 12 to 20 percent, and very severe on slopes of more than 20 percent.

For use by small mammals and deer, limitations are slight on slopes of 2 to 12 percent, moderate on slopes of 12 to 20 percent, severe on slopes of 20 to 30 percent, and very severe on slopes of more than 30 percent. Deer and small mammals normally avoid areas of steeper soils unless they are forced to use them.

WILDLIFE GROUP 7

This group consists of droughty soils that have a coarse textured or moderately coarse textured surface layer. Slopes range from 1 to 12 percent. Internal drainage is rapid, and the available moisture capacity is medium. Of the total acreage, a large part is cropland and the rest is wooded and used for wildlife. Some areas are eroded.

The soils in this group are poorly suited to grain crops and seed crops, and they support a rather small number of native woodland plants. Cover and escape routes can be provided, however, by planting suitable species along fence rows and field borders. If the soils are cultivated, they are subject to blowing and, in sloping areas, to water erosion.

For use of these soils by migratory waterfowl and furbearers, limitations are severe on slopes of 1 to 6 percent and very severe on slopes of more than 6 percent. Developing small areas of shallow water is difficult, and wetland food and cover plants grow poorly. Generally, water is not available to furnish suitable habitat for furbearers.

For use by upland game birds and songbirds, limitations are moderate on slopes of 1 to 6 percent and severe on slopes of 6 to 12 percent.

For use by small mammals and deer, limitations are moderate. In some places the soils produce an inadequate growth of grain, grasses, and legumes for deer, and generally they do not provide enough cover and woodland food plants. The number of squirrels is low because den trees are commonly lacking, and so are mast and other natural foods. Also, the absence of natural foods limits the rabbit population in some places.

WILDLIFE GROUP 8

This group consists of alluvial soils that are subject to flooding. These soils have high or very high available moisture capacity and are high in natural fertility. In most places they are cultivated or lie adjacent to cultivated fields.

Improved drainage is needed on most of these soils for the best growth of grain crops, seed crops, and legumes. Such crops may be damaged by floodwater, especially in rainy periods. Frequent flooding is a hazard to birds and small mammals that nest on the ground.

Limitations to use of these soils by furbearers are only slight. Water is generally available to provide suitable habitat, and many kinds of aquatic plants, including woody ones, produce food and cover in abundance.

Limitations to use by migratory waterfowl, upland game birds, songbirds, small mammals, and deer are moderate. Only a few mast trees, den trees, and other woodland plants occur on these soils, and wild herbaceous plants, as well as wetland food and cover plants, are scarce or lacking in some places. Consequently, there may be a small population of squirrels and birds. Wood ducks generally need boxes or planted trees for nesting.

WILDLIFE GROUP 9

In this group are very poorly drained organic soils. Although these soils are cropped in many areas, most of their acreage is covered with native plants and is used for wildlife and woodland.

Improved drainage is needed for a satisfactory growth of grain crops, seed crops, and legumes. Even after the soils are drained, however, they are not well suited to many kinds of legumes. At times when rainfall is heavy or the water table is high, burrows and nesting sites on the ground are flooded in some places. Trees, shrubs, and woody vines are so scarce in many areas that birds cannot nest and little woodland food is produced.

Limitations to use of these soils by migratory waterfowl and furbearers are only slight. Shallow water developments and suitable water habitat are easily provided, and water can be maintained at a desired level without difficulty. Wetland food and cover plants can be expected to grow well. Nesting boxes or trees are needed for wood ducks.

Limitations to use by upland game birds, songbirds, small mammals, and deer are moderate. Unless drainage is improved, wild food plants grow poorly. In most

places only a small number of den trees are available for squirrels and few or no acorns are produced.

WILDLIFE GROUP 10

This group consists of miscellaneous land types that differ greatly in soil characteristics and relief. Some areas are now used for wildlife and recreation.

Limitations to use of these land types by migratory waterfowl and furbearers are severe or very severe. The land is too steep for shallow water developments and other water habitat, or it is too infertile or too intensively used by man for the production of enough food and cover.

Limitations to use by upland game birds, songbirds, small mammals, and deer are very severe. Food and protective cover generally are inadequate or lacking, and in many areas there is no habitat for nesting. A few squirrels live in places where old trees provide dens and acorns or other mast.

WILDLIFE GROUP 11

This group consists of well drained or moderately well drained soils that formed under a cover of prairie grasses and have medium internal drainage. Slopes range from 0 to 12 percent. These soils are high in natural fertility and are cropped intensively. Their use for wildlife is generally limited to birds and mammals that can live in open areas. A few of the soils are eroded.

The soils in this group can produce a good growth of grain crops, seed crops, and legumes. Wild herbaceous and woody plants generally are lacking, and in most areas they must be planted. Many suitable kinds grow well along fence rows, on the edges of fields, and in similar areas. Erosion limits the use of sloping soils for grain and seed crops.

For use of these soils by migratory waterfowl and furbearers, limitations are moderate on slopes of 0 to 6 percent and severe on slopes of 6 to 12 percent. The soils are not well suited to wetland food and cover plants, and a water habitat is difficult to provide.

For use by upland game birds, limitations are slight on slopes of 0 to 6 percent and moderate on slopes of 6 to 12 percent.

For use by songbirds, limitations are moderate on slopes of 0 to 6 percent and severe on slopes of 6 to 12 percent. Only a few trees and woody vines grow on these soils, and songbirds generally cannot find suitable habitat, except in plants growing in fence rows and along field borders.

For use by small mammals and deer, limitations are moderate. Scattered oak trees occur, but otherwise there is little protective cover.

WILDLIFE GROUP 12

This group consists of somewhat poorly drained soils that formed under a cover of water-tolerant grasses and have slow internal drainage. Slopes range from 0 to 3 percent. These soils are used mainly for crops, but some kinds of plants do not grow well unless drainage is improved. Trees are few and scattered.

After these soils are drained, they produce a good growth of grain crops, seed crops, grasses, and legumes. Trees, shrubs, and vines are scarce or lacking, and they must be planted if these kinds of woody growth are desired for food and cover. Flooding or ponding is a hazard to birds that nest on the ground.

Limitations to use of these soils by migratory waterfowl, songbirds, rabbits, and deer are only slight. Providing small developments of shallow water generally is relatively easy, and maintaining the water at a desired level usually is not difficult. Wetland food and cover plants, as well as many other kinds of plants, can be expected to grow well. Unless cover is available nearby, however, deer do not use the soils of this group.

Limitations to use by furbearers, upland game birds, and squirrels are moderate. In some places enough water is available to furnish suitable habitat for furbearers, but commonly it is difficult to maintain the water at a desired level. A wide variety of aquatic plants can grow on these soils. Although wild herbaceous species must be planted in most areas, many suitable kinds do well along fence rows, on the edges of fields, and in similar areas. A few widely scattered hardwoods occur in some places, but the general absence of trees keeps the squirrel population to a minimum.

Engineering Uses of the Soils [1]

Some soil properties are of special interest to engineers, because they affect the construction and maintenance of roads, airports, and pipelines, the foundations of buildings, facilities for storing water, structures for controlling erosion, drainage systems, and systems for disposing of sewage. The properties most important to engineers are permeability to water, shear strength, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and reaction. Also important are depth to water table, flooding hazard, depth to bedrock or to sand and gravel, and relief. Such information is made available in this subsection. Engineers can use it to—

1. Make soil and land use studies that will aid in selecting and developing industrial, commercial, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils that will help in planning agricultural drainage systems, farm ponds, irrigation systems, waterways, and diversions and terraces.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways, airports, pipelines, and cables and in planning detailed investigations at the selected locations.
4. Locate probable sources of gravel and other construction materials.
5. Correlate performance of engineering structures with soil mapping units, and thus develop information for overall planning that will be useful in designing and maintaining certain engineering practices and structures.

[1] Prepared in cooperation with the State Highway Commission of Wisconsin, Bureau of Public Roads, and the Soil Survey Division of Wisconsin Geologic and Natural History Survey.

6. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and from aerial photographs.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

It should be emphasized that the interpretations made in this soil survey may not eliminate the need for sampling and testing at a site chosen for a specific engineering work that involves heavy loads or at a site where excavations are to be deeper than the depths of the layers here reported. Also, engineers should not apply specific values to the adjective ratings for bearing capacity given in this survey. Nevertheless, by using this survey, an engineer can select and concentrate on those soil units most important for his proposed kind of construction, and in this manner he can reduce the number of samples taken for laboratory testing and complete an adequate soil investigation at minimum cost.

The soil mapping units shown on the maps in this survey may include small areas of a different soil material. These areas of included soils may be as much as 2 acres in size. They are too small to be mapped separately and generally are not significant to the agriculture in the area but may be important in engineering planning.

Information of value in planning engineering work is given throughout the text, particularly in the sections "Descriptions of the Soils" and "Formation and Classification of Soils."

Some of the terms used by soil scientists may be unfamiliar to the engineer, and some words—for example, soil, clay, silt, and sand—may have special meaning in soil science. These and other special terms used in the soil survey are defined in the Glossary. Most of the information about engineering is given in tables 2, 3, 4, 5, and 6.

Engineering classification systems

Agricultural scientists of the U.S. Department of Agriculture classify soils according to texture. In some ways this system of naming textural classes is comparable to the two systems most commonly used by engineers for classifying soils.

Most highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials (AASHO) (*1*).[2] In this system soil materials are classified in seven principal groups, based on gradation, liquid limit, and plasticity index. The groups range from A–1 (gravelly soils having high bearing capacity, the best soils for subgrade) to A–7 (clayey soils having low strength when wet, the poorest soils for subgrade). Within each group the relative engineering value of the soil material is indicated by a group index number. The numbers range from 0 for the best materials to 20 for the poorest. The group index number is shown in parentheses after the soil group symbol in table 2.

[2] Italic numbers in parentheses refer to Literature Cited, p. 111.

Some engineers prefer to use the Unified classification system (*8*). In this system soil materials are identified according to texture and plasticity and performance as engineering construction material. They are identified as coarse grained (eight classes), fine grained (six classes), and highly organic. The last column of table 2 gives the classification of the tested soils according to the Unified system.

Engineering test data

Soil samples representing seven extensive series in Kenosha and Racine Counties were sampled at representative locations and tested by the State Highway Commission of Wisconsin under a cooperative agreement with the U.S. Department of Commerce, Bureau of Public Roads. These samples were tested in accordance with the standard procedures of AASHO to help evaluate the soils for engineering purposes. The results of these tests and the classification of each soil sample according to both the AASHO and the Unified systems are given in table 2.

The samples tested do not represent the entire range of soil characteristics in Kenosha and Racine Counties, or even within the soil series sampled. The results of the tests, however, can be used as a general guide in estimating the physical properties of the soils in the two counties. Tests were made for moisture density relationships, grain-size distribution, liquid limit, and plasticity index.

In the *moisture density*, or compaction test, a sample of the soil material is compacted several times with a constant compactive effort, each time at a successively higher moisture content. The moisture content increases until the optimum moisture content is reached. After that the density decreases with increase in moisture content. The highest density obtained in the compaction test is termed "maximum dry density." Moisture-density data are important in construction, for as a rule, optimum stability is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

The results of the mechanical analysis, obtained by combined sieve and hydrometer methods, may be used to determine the relative proportions of the different size particles that make up the soil sample. The percentage of fine-grained material, obtained by the hydrometer method, which generally is used by engineers, should not be used in determining textural classes of soils.

The tests to determine liquid limit and plastic limit measure the effect of water on consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The *plastic limit* is the moisture content at which the soil material passes from a semisolid to a plastic state. The *liquid limit* is the moisture content at which the soil material passes from a plastic to a liquid state. The *plasticity index* is the numerical difference between liquid limit and plastic limit. It indicates the range in moisture content within which a soil material is in a plastic condition.

TABLE 2.—*Engineering*

[Tests performed by the State Highway Commission of Wisconsin in cooperation with the U.S. Department of Commerce, Bureau

KENOSHA

Soil name and location	Parent material	SCS report number	Depth from surface	Moisture-density data [1]	
				Maximum dry density	Optimum moisture
			Inches	*Lb. per cu. ft.*	*Percent*
Morley silt loam: NE¼SE¼SW¼ sec. 30, T. 2 N., R. 21 E. (Modal profile)	Thin loess over silty clay loam glacial till.	S61-Wis-30-1-1	11-20	100	22
		S61-Wis-30-1-2	24-36	111	18
		S61-Wis-30-1-3	36-48	119	14
NW¼NW¼ sec. 18, T. 2 N., R. 20 E. (Formed in till coarser textured than modal)	Thin loess over glacial till with lenses of silt and fine sand.	S62-Wis-30-1-1	10-24		
		S62-Wis-30-1-2	30-36		
		S62-Wis-30 1 3	36-48		
Mundelein silt loam: NE¼SW¼ sec. 19, T. 1 N., R. 22 E. (Modal profile)	Lacustrine sediments.	S64-Wis-30-2-1	15-22		
		S64-Wis-30-2-2	31-60		
Varna silt loam: NE¼NW¼ sec. 20, T. 1 N., R. 21 E. (High silt content in B and C horizons)	Thin loess over clayey glacial till.	S64-Wis-30-1-1	25-30		
		S64-Wis-30-1-2	32-54		

RACINE

Darroch fine sandy loam: NE¼NE¼ sec. 4, T. 3 N., R. 22 E. (Coarse-textured profile)	Lacustrine sediments.	S64-Wis-51-5-1	21-28		
		S64-Wis-51-5-2	30-54		
Hebron sandy loam: NE¼SE¼ sec. 15, T. 2 N., R. 19 E. (Modal profile)	Glacial outwash over lacustrine sediments.	S62-Wis-51-1-1	12-28	121	12
		S62-Wis 51 1 2	32-42	113	17
Martinton silt loam: SE¼SE¼ sec. 5, T. 2 N., R. 19 E. (Modal profile)	Thin loess over lacustrine sediments.	S64-Wis-51-3-1	21 26		
		S64-Wis-51-3-2	27-56		
Mundelein silt loam: SE¼SW¼ sec. 2, T. 4 N., R. 22 E. (Modal profile)	Lacustrine sediments.	S64-Wis-51-4-1	17-20	111	16
		S64-Wis-51-4-2	44-52	120	12
Saylesville loam: NE¼SW¼ sec. 23, T. 2 N., R. 19 E. (Formed in outwash coarser textured than modal)	Thin glacial outwash over lacustrine sediments.	S62-Wis-51-2-1	10-18		
		S62-Wis-51-2-2	22-60		
Varna silt loam: NW¼SE¼ sec. 32, T. 3 N., R. 21 E. (Thin solum)	Very thin loess over glacial till.	S64-Wis-51-2-1	12-18		
		S64-Wis-51-2-2	25-60		

[1] Based on AASHO Designation: T 99-57, Method C (*1*).

[2] Mechanical analyses according to the AASHO Designation T 88 (*1*). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soils.

test data

of Public Roads, in accordance with standard procedures of the American Association of State Highway Officials (AASHO) (*1*)]

COUNTY

Mechanical analysis [2]										Liquid limit	Plasticity index	Classification	
Percentage passing sieve						Percentage smaller than—						AASHO	Unified [3]
1½-in.	¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
			100	99	92	92	91	70	60	60	35	A–7–6(20)	CH
			100	98	90	90	84	50	34	34	17	A–6(11)	CL
			100	98	89	89	84	52	36	32	14	A–6(10)	CL
			100	97	86	85	79	56	44	48	25	A–7–6(16)	CL
			100	95	83	81	69	41	31	28	10	A–4(8)	CL
			100	97	81	75	49	21	15	20	3	A–4(8)	ML
			100	94	49	44	32	20	16	21	5	A–4(3)	SM–SC
			100	98	75	67	37	16	12	19	2	A–4(8)	ML
			100	96	79	77	69	47	37	44	22	A–7–6(14)	CL
	100	96	94	89	77	74	59	31	20	23	7	A–4(8)	ML–CL

COUNTY

				100	27	21	17	16	15	[4] NP	NP	A–2–4(0)	SM
				100	27	13	3	1	1	NP	NP	A–2–4(0)	SM
		100	95	79	28	28	26	20	18	22	8	A–2–4(0)	SC
			100	99	96	96	95	64	44	36	18	A–6(11)	CL
			100	99	93	93	89	60	48	57	32	A–7–6(19)	CH
			100	99	96	96	90	53	36	31	13	A–6(9)	CL
			100	99	53	47	36	27	22	29	11	A–6(4)	CL
				100	79	68	34	11	7	NP	NP	A–4(8)	ML
			100	99	94	93	92	76	63	62	37	A–7–6(20)	CH
			100	99	99	99	97	65	46	37	18	A–6(11)	CL
			100	96	87	86	81	58	45	51	26	A–7–6(17)	CH
100	99	95	93	90	83	82	74	50	36	32	14	A–6(10)	CL

[3] SCS and BPR have agreed to consider that all soils having plasticity indexes within 2 points from A-line are to be given a borderline classification. Examples of borderline classifications obtained by this use are SM–SC and ML–CL.

[4] Nonplastic.

TABLE 3.—*Estimated engineering*

[Dashed lines indicate that information

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	Classification	
			Dominant USDA texture	Unified
	Feet	*Inches*		
Adrian (Ac)	0–1	0–32	Muck	Pt
		32–60	Sand	SP
Ashkum (AtA)	0–1	0–13	Silty clay loam	CL
		13–37	Silty clay loam	CH
		37–60	Silty clay loam	CL
Aztalan (AuA, AzA, AzB)	1–3	0–16	Loam	ML
		16–35	Clay loam	CL
		35–60	Silty clay loam	CL
Beecher (BcA)	1–3	0–12	Silt loam	ML
		12–28	Silty clay	CH
		28–60	Silty clay loam	CL
Blount (BlA)	1–3	0–8	Silt loam	ML
		8–28	Silty clay	CH
		28–60	Silty clay loam	CL
Boyer (BmB, BmC2, BnB)	3+	0–13	Sandy loam	SC
		13–29	Sandy loam	SM
		29–60	Sand	SP–SM
Casco (CcB, CcC2, CeB, CeB2, CeC2, CeD2, CoC, CoD, CrC, CrD2, CrE). (For properties of Miami soil in mapping units CoC and CoD, see the Miami series. For properties of Rodman soil in units CrC, CrD2, and CrE, see the Rodman series.)	3+	0–6	Loam	ML
		6–18	Clay loam	CH
		18–60	Sand and gravel	SP
Colwood (Cw)	0–1	0–14	Silt loam	ML
		14–40	Silty clay loam	CL
		40–60	Silt and very fine sand	ML
Conover (CyA)	1–3	0–12	Silt loam	ML
		12–31	Clay loam	CL
		31–60	Sandy loam	SM
Darroch, neutral variant (DaA)	1–3	0–14	Fine sandy loam	SM
		14–24	Loam	ML
		24–60	Silt loam	ML
Dorchester (Dh)	3+	0–52	Silt loam	ML
		52–60	Fine sandy loam	SM
Dresden (DrA)	3+	0–9	Loam	ML
		9–26	Clay loam	CL
		26–60	Sand and gravel	GP–GM
Drummer (Dt)	0–1	0–12	Silt loam	ML
		12–50	Silty clay loam	CL
		50–60	Sand and gravel	GP–GM
Elliott (EtA, EtB)	1–3	0–16	Silty clay loam	CL
		16–30	Silty clay	CL
		30–60	Silty clay, silty clay loam	CL
Fabius (FaA)	1–3	0–8	Loam	ML
		8–19	Clay loam	CL
		19–60	Sand and gravel	GP–GM
Fox: (FmB, FmC2, FoA, FoB, FoC2, FsA, FsB)	3+	0–11	Silt loam	ML
		11–35	Silty clay loam	CL
		35–60	Sand and gravel	GP–GM

Footnotes at end of table.

properties of the soils

is not available or does not apply]

Classification—Continued	Percentage passing sieve [1]—			Permeability	Available water capacity	Reaction	Shrink-swell potential
AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.07 mm.)				
				Inches per hour	*Inches per inch of soil*	*pH value*	
A-3	100	100	5	2. 0–6. 3 6. 3–20. 0	0. 04	5. 6–7. 3 7. 9–8. 4	Very low.
A-6 or A-7	100	100	90	0. 63–2. 0	. 20	6. 6–7. 3	High.
A-7	100	100	95	0. 20–0. 63	. 18	6. 6–7. 3	Moderate.
A-6	100	100	90	0. 20–0. 63	. 18	6. 6–7. 3	High.
A-4	100	100	60	0. 63–2. 0	. 20	7. 4–8. 4	Low.
A-6	100	100	65	0. 63–2. 0	. 18	5. 1–6. 5	Moderate.
A-6	100	100	100	0. 20–0. 63	. 20	5. 1–6. 5	Moderate.
A-4	100	95	80	0. 63–2. 0	. 22	5. 6–6. 5	Low.
A-7	100	100	90	0. 20–0. 63	. 18	5. 6–6. 5	High.
A-6	100	100	90	0. 20–0. 63	. 18	(2)	High.
A-4	100	95	80	0. 63–2. 0	. 20	5. 6–7. 3	Low.
A-7	100	100	90	0. 20–0. 63	. 18	5. 6–7. 3	High.
A-6	100	100	90	0. 20–0. 63	. 18	7. 4–8. 4	High.
A-2	100	85	30	2. 0–6. 3	. 12	5. 1 6. 5	Low.
A-2	85	85	20	2. 0–6. 3	. 12	4. 5–6. 5	Low.
A-3	95	95	5	>20. 0	. 04	7. 4–8. 4	Very low.
A-4	100	99	62	0. 63–2. 0	. 20	5. 6–6. 5	Low.
A-7	96	95	72	0. 63–2. 0	. 18	5. 1–6. 5	Moderate.
A-1	56	53	4	>20. 0	. 02	7. 4–8. 4	Very low.
A-4	100	95	80	0. 63–2. 0	. 22	6. 6–7. 3	Low.
A-6	100	100	89	0. 63–2. 0	. 18	6. 6 7. 3	High.
A-4	100	100	97	0. 63–2. 0	. 18	7. 4–8. 4	Low.
A-4	100	95	80	0. 63–2. 0	. 20	5. 6–6. 5	Low.
A-7	100	100	70	0. 20–0. 63	. 18	5. 6–6. 5	Moderate.
A-4	80	75	45	0. 63–2. 0	. 12	7. 4–8. 4	Low.
A-2	100	85	30	0. 63–2. 0	. 12	6. 6–7. 3	Low.
A-4	100	100	55	0. 63–2. 0	. 18	6. 6–7. 3	Low.
A-4	100	100	80	0. 63–2. 0	. 18	7. 4–8. 4	Low.
A-4	100	100	95	0. 63–2. 0	. 20	7. 9–8. 4	Low.
A-4	100	100	40	0. 63–2. 0	. 10	7. 9–8. 4	Low.
A-4	100	100	60	0. 63–2. 0	. 16	5. 6–6. 5	Low.
A-6	100	100	65	0. 63–2. 0	. 16	5. 1–6. 5	Moderate.
A-1	50	45	5	>20. 0	. 02	7. 4–8. 4	Very low.
A-4	100	95	80	0. 63–2. 0	. 20	5. 6–6. 5	Low.
A-7	95	95	60	0. 63–2. 0	. 18	6. 6–7. 3	High.
A-1	40	20	10	20. 0	. 02	7. 4–8. 4	Very low.
A-6	100	100	90	0. 63–2. 0	. 22	5. 6–6. 5	Low.
A-7	100	100	85	0. 20–0. 63	. 18	5. 6–7. 3	High.
A-6	100	97	87	0. 20 -0. 63	. 18	7. 4–8. 4	High.
A-4	100	100	60	0. 63–2. 0	. 20	5. 6–6. 5	Low.
A-6	100	100	60	0. 63–2. 0	. 16	5. 1–6. 5	Moderate.
A-1	40	20	10	>20. 0	. 02	7. 4–8. 4	Very low.
A-4	100	95	80	0. 63 -2. 0	. 20	5. 6–6. 5	Low.
A-7	100	100	95	0. 20–0. 63	. 18	5. 1–6. 5	High.
A-1	40	20	10	>20. 0	. 02	7. 4–8. 4	Very low.

TABLE 3.—*Estimated engineering*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	Classification	
			Dominant USDA texture	Unified
	Feet	*Inches*		
Fox—Continued				
(FrA, FrB)	1–3	0–11	Loam	ML
		11–30	Clay loam	CL
		30–42	Sand and gravel	GP–GM
		42–60	Clay	CH
Granby:				
(Gf)	0–1	0–8	Fine sandy loam	SM
		8–60	Fine sand	SP–SM
(Gm)	0–1	0–8	Fine sandy loam	SM
		8–40	Fine sand	SP
		40–60	Loam	ML
Granby, brown subsoil variant (GnA)	1–3	0–8	Fine sandy loam	SM
		8–60	Fine sand	SP–SM
Griswold (GsB, GsC2)	3+	0–10	Loam	ML
		10–25	Sandy clay loam	SC
		25–60	Sandy loam	SM
Hebron (HbB, HeA, HeB2, HeC2)	3+	0–11	Loam	ML
		11–28	Clay loam	CL
		28–60	Silty clay	CL
Hochheim (HmB, HmC2, HmD2)	3+	0–9	Loam	ML
		9–18	Clay loam	CL
		18–60	Sandy loam, gravelly loam	SM
Houghton (Ht)	0–1	0–60	Muck	Pt
Kane:				
(KaA)	1–3	0–14	Loam	ML
		14–30	Clay loam, loam	CL
		30–60	Sand and gravel	GP–GM
(KhA)	1–3	0–14	Loam	ML
		14–30	Clay loam	CL
		30–40	Sand and gravel	GP–GM
		40–60	Clay loam	CL
Knowles (KmB)	3+	0–12	Silt loam	ML
		12–24	Clay loam	CL
		24	Dolomite.	
Lawson, calcareous variant (Lp)	1–3	0–25	Silt loam	ML–CL
		25–48	Silty clay loam	CL
		48–60	Sandy loam	SM
Lorenzo (LyB)	3+	0–10	Loam	ML
		10–19	Sandy clay loam	CL
		19–60	Sand and gravel	SP–SM
Markham (MeB, MeB2, MeC2)	3+	0–10	Silt loam	ML
		10–28	Silty clay	CH
		28–60	Clay loam	CL
Martinton (MgA)	1–3	0–12	Silt loam	ML
		12–60	Silty clay loam	CL
Matherton:				
(MkA)	1–3	0–11	Loam	ML
		11–30	Clay loam, silty clay loam	CL
		30–60	Sand and gravel	GP–GM
(MlA)	1–3	0–10	Loam	ML
		10–32	Clay loam	CL
		32–42	Sand and gravel	GP–GM
		42–60	Silty clay	CH

Footnotes at end of table.

properties of the soils—Continued

Classification—Continued	Percentage passing sieve [1]—			Permeability	Available water capacity	Reaction	Shrink-swell potential
AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.07 mm.)				
				Inches per hour	*Inches per inch of soil*	*pH value*	
A–4	100	85	60	2. 0–6. 3	0. 12	5. 1–6. 5	Low.
A–7	100	90	70	0. 63–2. 0	. 12	5. 1–6. 5	Moderate.
A–1	35	30	5	>20. 0	. 02	7. 4–8. 4	Very low.
A–7	100	100	90	<0. 06	. 16	7. 4–8. 4	High.
A–2	100	85	30	2. 0–6. 3	. 16	5. 6–6. 5	Low.
A–3	100	100	5	6. 3–20. 0	. 04	6. 6–8. 4	Very low.
A–4	100	100	40	2. 0–6. 3	. 12	5. 6–6. 5	Low.
A43	100	100	5	2. 0–6. 3	. 04	6. 6–8. 4	Low.
A–6	100	100	65	0. 63–2. 0	. 16	7. 4–8. 4	Low.
A–2	100	85	30	2. 0–6. 3	. 16	5. 6–6. 5	Low.
A–3	100	100	5	6. 3–20. 0	. 04	6. 6–8. 4	Very low.
A–4	100	100	60	0. 63–2. 0	. 16	6. 6–7. 3	Low.
A–6	100	100	45	0. 63–2. 0	. 12	5. 1–6. 5	Moderate.
A 4	70	65	35	2. 0–6. 3	. 12	7. 4–8. 4	Low.
A–4	100	100	60	0. 63–2. 0	. 18	6. 6–7. 3	Low.
A–7 or A–6	100	90	65	0. 63–2. 0	. 18	5. 6–7. 3	Moderate.
A–6	100	100	95	0. 20–0. 63	. 18	7. 4–8. 4	High.
A 4	100	100	60	0. 63–2. 0	. 20	5. 6–7. 3	Low.
A–7	96	93	57	0. 63–2. 0	. 18	5. 6–7. 3	Moderate.
A–2	74	67	35	0. 63–2. 0	. 12	7. 4–8. 4	Low.
				2. 0–6. 3	>. 20	6. 1–7. 8	
A–4	100	100	60	0. 63–2. 0	. 18	5. 6–6. 5	Low.
A–7 or A–6	95	95	65	0. 63–2. 0	. 18	5. 1–6. 0	Moderate.
A–1	45	35	5	>20. 0	. 02	7. 4–8. 4	Very low.
A–4	100	100	60	0. 63–2. 0	. 18	5. 6–6. 5	Low.
A–7 or A–6	95	95	65	0. 63–2. 0	. 18	5. 1–6. 0	Moderate.
A–1	45	35	5	>20. 0	. 02	7. 4–8. 4	Very low.
A–7	95	95	65	0. 63–2. 0	. 18	7. 4–8. 4	Moderate.
A–4	100	95	80	0. 63–2. 0	. 20	5. 6–7. 3	Low.
A–7 or A–6	100	100	70	0. 63–2. 0	. 18	5. 6–7. 3	Moderate.
A–4 or A–6	100	100	95	0. 63–2. 0	. 22	7. 8–8. 4	Low.
A–7	100	100	90	0. 63–2. 0	. 18	7. 8–8. 4	High.
A–2	95	95	30	2. 0–6. 3	. 10	[2]	Low.
A–4	100	100	60	0. 63–2. 0	. 20	5. 6–6. 5	Low.
A–7	95	95	55	0. 63–2. 0	. 16	5. 1–6. 0	Moderate.
A–1	55	55	5	>20. 0	. 02	7. 4–8. 4	Very low.
A–4	100	95	80	0. 62–2. 0	. 20	5. 6–7. 3	Low.
A–7	100	100	90	0. 20–0. 63	. 16	5. 6–7. 3	High.
A–6	100	100	90	0. 20–0. 63	. 18	7. 4–8. 4	Moderate.
A–4	100	95	80	0. 63–2. 0	. 20	6. 6–7. 3	Low.
A–7 or A–6	100	100	95	0. 06–0. 20	. 18	7. 4–8. 4	High.
A–4	100	100	60	0. 63–2. 0	. 20	5. 6–6. 5	Low.
A–7	100	100	80	0. 63–2. 0	. 18	5. 1–6. 5	Moderate.
A–1	40	20	10	>20. 0	. 02	7. 4–8. 4	Very low.
A–4	100	100	60	0. 63–2. 0	. 20	5. 6–6. 5	Low.
A–7	100	100	80	0. 63–2. 0	. 18	5. 1–6. 5	Moderate.
A–1	40	20	10	>20. 0	. 02	7. 4–8. 4	Very low.
A–7	100	100	90	<0. 06	. 16	7. 4–8. 4	High.

TABLE 3.—*Estimated engineering*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	Classification	
			Dominant USDA texture	Unified
	Feet	*Inches*		
McHenry (MpB, MpC2)	3+	0–13	Silt loam	ML
		13–32	Clay loam	CL
		32–60	Sandy loam	SM
Miami:				
(MwB, MwC2, MwD2, MyB, MyC2)	3+	0–9	Silt loam	ML
		9–27	Clay loam	CL
		27–60	Loam	ML
(MxB, MxC2, MxD2)	3+	0–10	Loam	ML–CL
		10–29	Clay loam	CL
		29–60	Sandy loam	SM
Montgomery (Mzc)	0–1	0–30	Silty clay	CH
		30–60	Silty clay loam	CL
Morley (MzdB, MzdB2, MzdC, MzdC2, MzdD, MzdD2, MzdE, MzeC3, MzeD3).	3+	0–9	Silt loam	ML
		9–35	Silty clay	CH
		35–60	Silty clay loam	CL
Mundelein (MzfA)	1–3	0–13	Silt loam	ML
		13–25	Silty clay loam	CL
		25–60	Silt and sand	ML
Muskego (Mzg)	0–1	0–56	Muck and peat	Pt
		56–60	Silty clay loam	ML
Mussey (Mzk)	0–1	0–12	Loam	ML
		12–19	Sandy clay loam	SC
		19–60	Sand and gravel	GP–GM
Navan (Na)	0–1	0–15	Silt loam	ML
		15–35	Clay loam	CL
		35–60	Silty clay	CL
Ogden (Oc)	0–1	0–26	Muck	Pt
		26–60	Silty clay loam	CL
Palms (Pa)	0–1	0–25	Muck	Pt
		25–60	Loam	ML
Pella (Ph)	0–1	0–11	Silt loam	ML
		11–60	Silty clay loam	CH
Plano (Pt)	3+	0–17	Silt loam	ML
		17–42	Silty clay loam	CL
		42–50	Loam	ML
		50–60	Sand and gravel	GP–GM
Radford (RaA)	1–3	0–33	Silt loam	ML
		33–58	Silty clay loam	CH
		58–72	Clay loam	CL
Ringwood (RgB, RgC)	3+	0–13	Silt loam	ML
		13–29	Silty clay loam	CL
		29–60	Sandy loam	SM
Rodman (Mapped only in complexes with Casco soils.)	3+	0–5	Gravelly loam	SM
		5–60	Sand and gravel	GP–GM
Rollin (Rt)	0–1	0–32	Muck	Pt
		32–60	Marl	MH
St. Charles (SeA, SeB)	3+	0–11	Silt loam	ML
		11–48	Silty clay loam	CL
		48–60	Sand and gravel	SP–SM

Footnotes at end of table.

properties of the soils—Continued

Classification—Continued	Percentage passing sieve [1]—			Permeability	Available water capacity	Reaction	Shrink-swell potential
AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.07 mm.)	*Inches per hour*	*Inches per inch of soil*	*pH value*	
A–4	100	95	80	0. 63–2. 0	. 20	5. 1–6. 5	Low.
A–6	95	90	65	0. 63–2. 0	. 18	5. 1–6. 5	Moderate.
A–2	85	80	35	0. 63–2. 0	. 12	7. 4–8. 4	Low.
A–4	100	95	80	0. 63–2. 0	. 20	5. 6–6. 5	Low.
A–6	98	96	63	0. 63–2. 0	. 18	5. 1–6. 0	Moderate.
A–4	91	87	54	0. 63–2. 0	. 16	7. 4–8. 4	Low.
A–4	100	100	60	0. 63–2. 0	. 20	5. 1 6. 5	Low.
A 6	96	94	52	0. 63–2. 0	. 18	5. 1–6. 5	Moderate.
A–2	84	80	33	0. 63–2. 0	. 12	7. 4–8. 4	Very low.
A–7	100	100	95	0. 20–0. 63	. 20	6. 6–7. 3	High.
A–6	100	100	100	0. 06–0. 20	. 20	7. 4–8. 4	High.
A 4	100	95	80	0. 63–2. 0	. 20	5. 6–7. 3	Low.
A–7	100	100	92	0. 20–0. 63	. 18	5. 6–7. 3	High.
A–6	100	100	90	0. 20–0. 63	. 18	7. 4–8. 4	High.
A–4	100	95	80	0. 63–2. 0	. 22	5. 6–6. 5	Low.
A–6	100	100	53	0. 63–2. 0	. 18	5. 6–6. 0	High.
A–4	100	100	79	0. 63–2. 0	. 16	7. 4–8. 4	Low.
				0. 20–0. 63	>. 20	5. 6–7. 3	
A–6	100	100	85	0. 20–0. 63	. 20	7. 4–8. 4	High.
A–4	100	100	60	0. 63–2. 0	. 20	6. 6–7. 3	Low.
A–6	100	100	40	0. 63–2. 0	. 18	6. 6–7. 3	Moderate.
A–1	40	20	10	>20. 0	. 02	7. 4–8. 4	Very low.
A–4	100	95	80	0. 63–2. 0	. 20	6. 1–7. 3	Low.
A–6	100	100	60	0. 63–2. 0	. 18	6. 6–8. 4	Moderate.
A–6	100	100	95	0. 06 0. 20	. 16	7. 4–8. 4	High.
				2. 0–6. 3	>. 20	6. 1–7. 8	
A–6	85	85	70	<0. 06	. 18	7. 3–7. 8	High.
				2. 0–6. 3	>. 20	5. 6–7. 3	
A–4	100	100	65	0. 20–0. 63	. 20	7. 8–8. 4	Low.
A–4	100	95	80	2. 0–6. 3	. 22	6. 6–7. 3	Low.
A–7	100	100	100	0. 20–0. 63	. 20	6. 6–8. 4	High.
A 4	100	95	80	0. 63–2. 0	. 22	5. 6–6. 5	Low.
A–6	95	90	85	0. 63–2. 0	. 20	5. 1–6. 0	High.
A–4	95	90	65	0. 63–2. 0	. 16	6. 1–6. 5	Moderate.
A–1	45	35	5	>20. 0	. 02	7. 4–8. 4	Very low.
A–4	100	100	95	0. 63–2. 0	. 20	5. 6–6. 5	Low.
A–7	100	100	100	0. 20–0. 63	. 18	5. 6–6. 5	High.
A–6	100	90	70	0. 20–0. 63	. 16	7. 4–8. 4	Moderate.
A–4	100	95	80	0. 63–2. 0	. 20	5. 6–6. 5	Low.
A–6	100	100	100	0. 63–2. 0	. 20	5. 1–6. 5	High.
A–4	70	65	35	0. 63–2. 0	. 12	7. 4–8. 4	Low.
A–2	70	65	30	2. 0–6. 3	. 02	6. 6–7. 3	Very low.
A–1	50	45	8	>20. 0	. 02	7. 4–8. 4	Very low.
				2. 0–6. 3	>. 20	6. 6–7. 3	
A–7	100	100	90	0. 06–0. 20	. 16	7. 4–8. 4	High.
A–4	100	95	80	0. 63–2. 0	. 20	5. 6–6. 5	Low.
A–7	100	100	98	0. 63–2. 0	. 18	5. 1–6. 5	High.
A–2	80	73	12	>20. 0	. 02	7. 4–8. 4	Very low.

TABLE 3.—*Estimated engineering*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	Classification	
			Dominant USDA texture	Unified
	Feet	*Inches*		
Sawmill, calcareous variant (Sg)	0–1	0–26	Silt loam	ML
		26–36	Silty clay loam	ML
		36–60	Loam	CL
Saylesville (ShA, ShB, ShC2)	3+	0–8	Silt loam	ML
		8–28	Silty clay	CH
		28–60	Silty clay loam	CL
Saylesville, dark surface variant (SkA, SkB)	3+	0–15	Silt loam	ML
		15–33	Silty clay	CH
		33–60	Silty clay loam	CL
Sebewa:				
(Sm)	0–1	0–11	Silt loam	ML
		11–30	Clay loam	CL
		30–60	Sand and gravel	GP–GM
(So)	0–1	0–10	Silt loam	ML
		10–30	Clay loam	CL
		30–40	Sand and gravel	GP–GM
		40–60	Clay loam	CL
Sisson:				
(SrB)	3+	0–8	Fine sandy loam	SM
		8–31	Clay loam	CL
		31–60	Silt and fine sand	ML
(SsB)	3+	0–8	Fine sandy loam	SM
		8–30	Clay loam	CL
		30–42	Silt and fine sand	ML
		42–60	Silty clay loam	CL
Symerton (SzA, SzB)	3+	0–19	Loam	ML
		19–38	Loam, clay loam	CL
		38–60	Silty clay loam	CL
Theresa (ThB)	3+	0–9	Silt loam	ML
		9–28	Clay loam	CL
		28–60	Gravelly loam	SM
Varna (VaB, VaB2, VaC2)	3+	0–18	Silt loam	ML–CL
		18–32	Silty clay	CH
		32–60	Clay loam	CL
Wallkill (Wa)	0–1	0–24	Silt loam	ML
		24–60	Muck	Pt
Warsaw:				
(WeA, WeB, WhA, WhB)	3+	0–14	Loam	ML
		14–30	Sandy clay loam	CL
		30–60	Sand and gravel	GP–GM
(WgA, WgB)	3+	0–10	Loam	ML–CL
		10–30	Clay loam	CL
		30–40	Sand and gravel	GP–GM
		40–60	Clay loam	CL
Wasepi:				
(WmA)	1–3	0–8	Fine sandy loam	SM
		8–25	Loam	ML
		25–60	Sand	SP
(WnA)	1–3	0–8	Fine sandy loam	SM
		8–25	Loam	ML
		25–40	Sand	SP
		40–60	Silty clay	CH
Worthen (WyA)	3+	0–34	Silt loam	ML
		34–58	Silty clay loam	CH
		58–60	Gravelly sandy loam	SP
Yahara (YaA)	1–3	0–22	Fine sandy loam	SM
		22–60	Silt and fine sand	SM
Zurich (ZuA, ZuB, ZuC2)	3+	0–8	Silt loam	ML
		8–39	Silty clay loam	CL
		39–60	Silt and fine sand	ML

[1] The range in values for the percentage passing the various sieves is plus or minus 5 percent of the value given.
[2] Calcareous.
[3] Variable.

properties of the soils—Continued

Classification—Continued	Percentage passing sieve [1]—			Permeability	Available water capacity	Reaction	Shrink-swell potential
AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.07 mm.)				
				Inches per hour	*Inches per inch of soil*	*pH value*	
A–4	100	100	95	0. 63–2. 0	0. 20	7. 9–8. 4	Low.
A–7	100	100	85	0. 20–0. 63	. 18	7. 9–8. 4	High.
A–4	100	100	60	0. 63–2. 0	. 16	[2]	Low.
A–4	100	95	80	0. 63–2. 0	. 20	6. 6–7. 3	Low.
A–7	100	100	95	0. 20–0. 63	. 16	5. 6–7. 3	High.
A–6	100	100	100	0. 06–0. 20	. 18	7. 4–8. 4	High.
A–4	100	95	80	0. 63–2. 0	. 22	5. 6–6. 5	Low.
A–7	100	100	95	0. 20–0. 63	. 16	5. 6–6. 5	High.
A–6	100	100	100	0. 06–0. 20	. 18	7. 4–8. 4	High.
A–4	100	95	80	0. 63–2. 0	. 20	6. 6–7. 3	Low.
A–7	95	95	65	0. 63–2. 0	. 18	6. 6–7. 3	Moderate.
A–1	40	20	10	>20. 0	. 02	7. 4–8. 4	Very low.
A–4	100	95	80	0. 63–2. 0	. 20	6. 6–7. 3	Low.
A–7	95	95	65	0. 63–2. 0	. 18	6. 6–7. 3	Moderate.
A–1	40	20	10	>20. 0	. 02	7. 4–8. 4	Very low.
A–7	95	95	65	0. 63–2. 0	. 18	7. 4–8. 4	Moderate.
A–2	100	85	30	0. 63–2. 0	. 14	5. 6–7. 3	Low.
A–6	100	100	65	0. 63–2. 0	. 16	5. 6–7. 3	Moderate.
A–4	100	100	80	0. 63–2. 0	. 14	7. 4–8. 4	Low.
A–2	100	85	30	2. 0–6. 3	. 16	5. 6–6. 5	Low.
A–6	100	100	65	0. 20–0. 63	. 16	6. 1–7. 3	Moderate.
A–4	100	100	80	0. 20–0. 63	. 16	6. 6–7. 8	Moderate.
A–7	100	100	95	0. 20–0. 63	. 18	7. 4–8. 4	High.
A–4	100	100	60	0. 63–2. 0	. 18	5. 1–6. 5	Low.
A–6	100	100	65	0. 63–2. 0	. 16	5. 1–6. 5	Moderate.
A–6	100	100	95	0. 06–0. 20	. 18	7. 4–8. 4	High.
A–4	100	95	80	0. 63–2. 0	. 20	6. 1–7. 3	Low.
A–7 or A–6	100	100	65	0. 63–2. 0	. 18	6. 1–6. 5	Moderate.
A–2	70	65	30	0. 63–2. 0	. 12	7. 4–8. 4	Low.
A–4	100	95	80	0. 63–2. 0	. 20	5. 6–6. 5	Low.
A–7	100	100	87	0. 20–0. 63	. 18	5. 6–7. 3	High.
A–6	95	93	83	0. 20–0. 63	. 18	7. 4–8. 4	High.
A–4	100	100	95	0. 63–2. 0	. 20	5. 6–7. 3	Low.
				2. 0–6. 3	>. 20	[3]	
A–4	100	100	60	0. 63–2. 0	. 20	5. 6–6. 5	Low.
A–7	95	95	60	0. 63–2. 0	. 18	5. 1–6. 0	Moderate.
A–1	45	35	5	>20. 0	. 02	7. 4–8. 4	Very low.
A–4	100	95	65	0. 63–2. 0	. 22	5. 6–6. 5	Low.
A–7	95	95	60	0. 63–2. 0	. 18	5. 1–6. 0	Moderate.
A–1	45	35	5	>20. 0	. 02	7. 4–8. 4	Very low.
A–7	95	95	70	0. 63–2. 0	. 18	7. 4–8. 4	Moderate.
A–2	100	85	30	2. 0–6. 3	. 12	5. 1–6. 5	Low.
A–2	90	90	55	0. 63–2. 0	. 16	4. 5–6. 5	Low.
A–3	100	100	3	>20. 0	. 04	7. 4–8. 4	Very low.
A–2	100	85	30	2. 0–6. 3	. 12	5. 1–6. 5	Low.
A–2	90	90	55	0. 63–2. 0	. 16	4. 5–6. 5	Low.
A–3	100	100	3	>20. 0	. 04	7. 4–8. 4	Very low.
A–7	100	100	90	<0. 06	. 16	7. 4–8. 4	High.
A–4	100	100	95	0. 63–2. 0	. 20	5. 6–7. 3	High.
A–7	100	100	95	0. 63–2. 0	. 20	5. 6–6. 5	High.
A–2	75	60	25	2. 0–6. 3	. 10	7. 4–8. 4	Low.
A–2	100	85	30	0. 63–2. 0	. 12	5. 6–6. 5	Low.
A–4	100	100	40	0. 63–2. 0	. 08	7. 4–8. 4	Low.
A–4	100	95	80	0. 63–2. 0	. 20	5. 6–6. 5	Low.
A–7	100	100	76	0. 63–2. 0	. 18	5. 6–6. 5	High.
A–4	100	100	70	0. 63–2. 0	. 14	7. 4–8. 4	Low.

TABLE 4.—*Engineering interpretations for specified uses*

Soil series, land types, and map symbols [1]	Suitability as a source of—		Degree and kind of limitations affecting—		Corrosion potential for metal conduits
	Topsoil	Sand and gravel	Road subgrade	Foundations for low buildings	
Adrian (Ac)	Poor; soil is erodible and oxidizes rapidly.	Fair; underlying sand variable; high water table hinders excavation.	Very severe; organic material is unsuitable for subgrades.	Very severe; organic material is unsuitable for foundations.	Very high in the organic materials; moderate in the sand.
Alluvial land (Am)	Fair; variable	Unsuitable; variable; occasional flooding.	Severe; stability and bearing capacity variable; occasional flooding.	Very severe; occasional flooding.	Moderate.
Ashkum (AtA)	Surface layer good; subsoil claycy; high water table most of the year.	Unsuitable; clayey	Very severe in subsoil; severe in substratum; moderate shrink-swell potential; low bearing capacity; elastic.	Very severe; fair shear strength; highly compressible; moderate to high shrink-swell potential; low bearing capacity; high water table.	High.
Aztalan: (AuA)	Surface layer good; subsoil poor; lower subsoil unstable on slopes.	Unsuitable; low sand and gravel content.	Slight in subsoil, moderate stability and bearing capacity when wet; severe in substratum, unstable when wet.	Moderate; moderate to high shrink-swell potential; high compressibility; poor shear strength; high water table, seepage, or both.	High.
(AzA, AzB)	Surface layer good; subsoil fair to poor; lower subsoil unstable on slopes.	Unsuitable; low sand and gravel content.	Moderate in subsoil, low stability and bearing capacity when wet; severe in substratum, unstable when wet.	Moderate; moderate to high shrink-swell potential; high compressibility; poor shear strength; high water table, seepage, or both.	High.
Beecher (BcA)	Surface layer good, dark colored; subsoil unsuitable, clayey.	Unsuitable; clayey	Very severe in subsoil, high shrink-swell potential; severe in substratum, moderate shrink-swell potential, low bearing capacity when wet.	Moderate; fair shear strength; moderate compressibility; moderate to high shrink-swell potential; low bearing capacity; high water table.	High.
Blount (BlA)	Surface layer fair, thin; subsoil poor, clayey.	Unsuitable; clayey	Very severe in subsoil, high shrink-swell potential; severe in substratum, moderate shrink-swell potential; low bearing capacity, elastic.	Moderate; fair shear strength; high compressibility; moderate to high shrink-swell potential; low bearing capacity; high water table, seepage, or both.	High.
Boyer: (BmB, BmC2)	Surface layer very poor; subsoil unsuitable, erodible and thin; underlain by sand and gravel.	Fair; poorly graded sand and, in some places, pockets of gravel.	Slight in subsoil, good bearing capacity when properly compacted, low shrink-swell potential; slight in substratum, lacks stability under wheel loads, low shrink-swell potential.	Slight; very low compressibility; low shrink-swell potential; good shear strength; good bearing capacity.	Low.

Footnotes at end of table.

TABLE 4.—*Engineering interpretations for specified uses*—Continued

Soil series, land types, and map symbols [1]	Suitability as a source of—		Degree and kind of limitations affecting—		Corrosion potential for metal conduits
	Topsoil	Sand and gravel	Road subgrade	Foundations for low buildings	
Boyer—Continued (BnB)	Surface layer poor, thin; subsoil poor, thin.	Fair; poorly graded sand and, in some places, pockets of gravel.	Slight in subsoil, good stability when properly compacted, low shrink-swell potential; slight in substratum, lacks stability under wheel loads, low shrink-swell potential.	Slight; very low compressibility; low shrink-swell potential; good shear strength; good bearing capacity.	Low.
Casco: (CeB, CeB2, CeC2, CeD2, CoC, CoD, CrC, CrD2, CrE) (For interpretations of Miami soil in units CoC and CoD, see unit MwB under the Miami series. For interpretations of Rodman soil in units CrC, CrD2, and CrE, see the Rodman series.)	Surface layer good but thin; subsoil poor, clayey; thin over gravel.	Good; substratum is poorly graded, stratified sand and gravel.	Moderate in subsoil, moderate shrink-swell potential; slight in substratum, very stable.	Slight; very low compressibility; low shrink-swell potential; good shear strength.	Low.
(CcB, CcC2)	Surface layer fair, thin; subsoil poor, clayey; thin over gravel.	Good; substratum is poorly graded, stratified sand and gravel.	Very severe in subsoil, high shrink-swell potential; very slight in substratum, very stable.	Slight; very low compressibility; low shrink-swell potential; good shear strength.	Low.
Colwood (Cw)	Surface layer good; subsoil fair, unstable on slopes; layers of silt, fine sand, and clay in some places; high water table.	Poor; in places the substratum contains layers of poorly graded fine sand and lenses of silt and clay.	Very severe in subsoil, low bearing capacity, unstable on slopes; severe in substratum, unstable, low bearing capacity.	Moderate; fairly low compressibility; moderately high susceptibility to frost heave; low bearing capacity on thawing; high water table.	Very high.
Conover (CyA)	Surface layer good; subsoil poor; lower subsoil gravelly in places.	Poor; pockets of well-graded sand and gravel in substratum.	Severe in subsoil, moderate shrink-swell potential, low bearing capacity when wet; slight in substratum, low shrink-swell potential, fair stability, high water table.	Slight; low compressibility; fair shear strength; moderate to good bearing capacity; high water table.	High.
Darroch, neutral variant (DaA).	Surface layer good; subsoil fair to poor, unstable on slopes; high water table.	Poor; poorly graded fine sand and, in places, layers of silt; high water table.	Severe in subsoil, low bearing capacity; moderate in substratum, relatively unstable, high water table.	Moderate; fairly low compressibility; moderately high susceptibility to frost heave; high water table, seepage, or both.	High.

Footnotes at end of table.

TABLE 4.—*Engineering interpretations for specified uses*—Continued

Soil series, land types, and map symbols [1]	Suitability as a source of—		Degree and kind of limitations affecting—		Corrosion potential for metal conduits
	Topsoil	Sand and gravel	Road subgrade	Foundations for low buildings	
Dorchester (Dh)	Surface layer good; subsoil fair; subject to stream overflow; thick soil.	Unsuitable; silty alluvium.	Severe in substratum, unstable at all moisture contents, very low stability and bearing capacity.	Severe; highly susceptible to frost heave; loss of strength on thawing; fair shear strength; moderate compressibility; occasional overflow.	Moderate.
Dresden (DrA)	Surface layer fair; subsoil poor; lower subsoil gravelly and droughty.	Good; substratum is poorly graded, stratified sand and gravel.	Moderate in subsoil, moderate shrink-swell potential, good bearing capacity; slight in substratum, very stable.	Slight; very low compressibility; low shrink-swell potential; good shear strength.	Low.
Drummer (Dt)	Surface layer good; dark, thick; subsoil fair; high water table.	Good; substratum is poorly graded, stratified sand and gravel; high water table may hinder excavation.	Moderate in subsoil, moderate shrink-swell potential, low stability; slight in substratum, very stable.	Moderate; very low shrink-swell potential; good shear strength; high water table.	High.
Elliott (EtA, EtB)	Surface layer good, thick, dark; subsoil poor, clayey.	Unsuitable; clayey	Very severe in subsoil; severe in substratum, moderate shrink-swell potential, low bearing capacity.	Moderate; fair shear strength; moderate compressibility; moderate to high shrink-swell potential; low bearing capacity; high water table, seepage, or both.	High.
Fabius (FaA)	Surface layer good but thin; subsoil poor, clayey; thin over gravel; high water table.	Good; substratum is poorly graded, stratified sand and gravel; high water table.	Moderate in subsoil, moderate shrink-swell potential; slight in substratum, very stable.	Moderate; very low compressibility; low shrink-swell potential; good shear strength; high water table, seepage, or both.	Moderate.
Fox: (FmB, FmC2)	Surface layer good; subsoil poor; lower subsoil commonly gravelly.	Good; substratum is poorly graded, stratified sand and gravel.	Moderate in subsoil, good bearing capacity when properly compacted; slight in substratum, very stable.	Slight; very low compressibility; good shear strength; low shrink-swell potential.	Low.
(FoA, FoB, FoC2, FsA, FsB).	Surface layer good; subsoil poor; lower subsoil unstable on slopes.	Unsuitable; thin layers of sand and gravel in places.	Moderate in subsoil, low stability and bearing capacity; severe in substratum, unstable when wet.	Moderate; moderate to high shrink-swell potential; high compressibility; poor shear strength.	Moderate.
(FrA, FrB)	Surface layer fair; subsoil poor; lower subsoil commonly gravelly.	Good; substratum is poorly graded, stratified sand and gravel.	Moderate in subsoil, good bearing capacity when properly compacted; slight in substratum, very stable.	Slight; very low compressibility; good shear strength; low shrink-swell potential.	Low.

Footnotes at end of table.

TABLE 4.—*Engineering interpretations for specified uses*—Continued

Soil series, land types, and map symbols [1]	Suitability as a source of—		Degree and kind of limitations affecting—		Corrosion potential for metal conduits
	Topsoil	Sand and gravel	Road subgrade	Foundations for low buildings	
Granby (Gf, Gm)	Surface layer fair; dark colored, thin; subsoil unsuitable, droughty; high water table.	Good; substratum is poorly graded sand; high water table hinders excavation.	Slight in subsoil, good stability, low shrink-swell potential; slight in substratum, stable under wheel loads when damp, low shrink-swell potential, may need to be confined under pavements.	Moderate; very low compressibility; low shrink-swell potential; good shear strength; high water table.	Moderate.
Granby, brown subsoil variant (GnA).	Surface layer poor, droughty, thick, dark colored; subsoil unsuitable, droughty; subject to soil blowing; high water table.	Good; substratum is poorly graded fine sand; high water table.	Slight in substratum, stable under wheel loads, low shrink-swell potential, suitable for all types of pavements when confined.	Moderate; good shear strength; very low compressibility; low shrink-swell potential; high water table.	Low.
Griswold (GsB, GsC2)	Surface layer good; subsoil poor, contains rock fragments in lower part.	Poor; substratum contains pockets of well-graded sand and gravel.	Severe in subsoil, moderate shrink-swell potential, low bearing capacity when wet; slight in substratum, good stability, and low shrink-swell potential.	Slight; low compressibility; good to fair shear strength.	Moderate.
Hebron (HbB, HeA, HeB2, HeC2).	Surface layer good; subsoil poor; lower subsoil unstable on slopes.	Unsuitable; thin layers of sand and gravel in places.	Moderate in subsoil, low stability and bearing capacity; severe in substratum, unstable when wet.	Moderate; moderate to high shrink-swell potential; high compressibility; poor shear strength.	Moderate.
Hochheim (HmB, HmC2, HmD2).	Surface layer good but thin; subsoil poor, clayey.	Poor; substratum contains pockets of well-graded sand and gravel.	Very severe in subsoil, high shrink-swell potential, low bearing capacity; slight in substratum, low shrink-swell potential, fair stability.	Slight; low compressibility; easy to compact; fair shear strength.	Moderate.
Houghton (Ht)	Poor; soil is erodible and oxidizes rapidly.	Unsuitable; no sand and gravel present.	Very severe; organic material is unsuitable for subgrade.	Very severe; organic material is unsuitable for foundations.	Very high.
Kane:					
(KaA)	Surface layer good, dark colored, thick; subsoil poor, clayey; high water table.	Good; substratum is poorly graded, stratified sand and gravel at depth of less than 40 inches; high water table.	Moderate in subsoil, moderate shrink-swell potential, good bearing capacity; slight in substratum, very stable.	Moderate; very low compressibility; low shrink-swell potential; good shear strength; high water table, seepage, or both.	Moderate.
(KhA)	Surface layer good; subsoil fair to poor; lower subsoil unstable on slopes.	Unsuitable; low sand and gravel content.	Moderate in subsoil, low stability and bearing capacity when wet; severe in substratum, unstable when wet.	Severe; moderate to high shrink-swell potential; high compressibility; poor shear strength; high water table, seepage, or both.	High.

TABLE 4.—*Engineering interpretations for specified uses*—Continued

Soil series, land types, and map symbols [1]	Suitability as a source of—		Degree and kind of limitations affecting—		Corrosion potential for metal conduits
	Topsoil	Sand and gravel	Road subgrade	Foundations for low buildings	
Knowles (KmB)	Surface layer good; subsoil poor; thin over bedrock.	Unsuitable; bedrock at depth of less than 42 inches.	Severe in subsoil; moderate shrink-swell potential, low bearing capacity when wet; slight in substratum, bedrock.	Slight; underlying bedrock provides excellent support for footings.	Moderate.
Lawson, calcareous variant (Lp).	Surface layer good, thick, dark colored; subsoil fair, thick; high water table.	Poor; high water table; layers of sand and gravel in places.	Severe in subsoil and substratum, relatively unstable, very low bearing capacity.	Severe; very high susceptibility to frost heave; loss of bearing capacity on thawing; fair shear strength; moderate compressibility.	Moderate.
Lorenzo (LyB)	Surface layer good, dark colored, thin; subsoil poor, clayey; thin over gravel.	Good; substratum is poorly stratified sand and gravel.	Moderate in subsoil, moderate shrink-swell potential; slight in substratum, very stable.	Slight; very low compressibility; moderate shrink-swell potential; good shear strength.	Low.
Markham (MeB, MeB2, MeC2).	Surface layer good, dark colored; subsoil poor, clayey.	Unsuitable; clayey	Very severe in subsoil, high shrink-swell potential; severe in substratum, moderate shrink-swell potential, low bearing capacity.	Moderate; fair shear strength; moderate compressibility; moderate shrink-swell potential; low bearing capacity.	Moderate.
Marsh (Mf)	Unsuitable; low content of mineral material; poorly drained.	Unsuitable; no sand and gravel present.	Very severe; poorly drained; low stability and bearing capacity.	Very severe; poorly drained; low stability and bearing capacity.	Very high.
Martinton (MgA)	Surface layer good; subsoil poor, clayey; unstable on slopes; high water table.	Unsuitable; no sand and gravel.	Very severe in subsoil, high plasticity and shrink-swell potential; severe in substratum, high shrink-swell potential, low bearing capacity.	Moderate; high shrink-swell potential; moderate compressibility; fair to poor shear strength; high water table, seepage, or both.	High.
Matherton: (MkA)	Surface layer good; subsoil poor; lower subsoil gravelly and droughty in places; high water table.	Good; substratum is poorly graded, stratified sand and gravel; high water table.	Moderate in subsoil, good bearing capacity when properly compacted; slight in substratum, very stable.	Slight; very low compressibility; low shrink-swell potential; good shear strength; high water table, seepage, or both.	Moderate.
(MlA)	Surface layer good; subsoil poor; lower subsoil is unstable on slopes; high water table.	Unsuitable; thin layers of sand and gravel in some places.	Moderate in subsoil, low shrink-swell potential; suitable for all types of pavement; severe in substratum, unstable.	Severe; moderate shrink-swell potential; high compressibility; poor shear strength; high water table, seepage, or both.	Moderate.

Footnotes at end of table.

TABLE 4.—*Engineering interpretations for specified uses*—Continued

Soil series, land types, and map symbols [1]	Suitability as a source of—		Degree and kind of limitations affecting—		Corrosion potential for metal conduits
	Topsoil	Sand and gravel	Road subgrade	Foundations for low buildings	
McHenry (MpB, MpC2).	Surface layer good; subsoil poor; lower subsoil sandy in places.	Poor; substratum contains pockets of well-graded sand and gravel.	Severe in subsoil, moderate shrink-swell potential, low bearing capacity; slight in substratum, moderate stability and bearing capacity when properly compacted.	Slight; low compressibility; good to fair shear strength.	Moderate.
Miami: (MwB, MwC2, MwD2, MyB, MyC2).	Surface layer good; subsoil poor; lower subsoil is gravelly.	Poor; substratum contains pockets of well-graded sand and gravel.	Severe in subsoil, high shrink-swell potential, low bearing capacity: moderate in substratum, low shrink-swell potential, fair stability.	Slight; low compressibility; fair shear strength; high bearing capacity.	Moderate.
(MxB, MxC2, MxD2).	Surface layer good but thin; subsoil poor; lower subsoil droughty in many places.	Fair; substratum contains pockets of well-graded sand and gravel.	Severe in subsoil, good stability, moderate shrink-swell potential.	Slight; low compressibility; good to fair shear strength.	Moderate.
Montgomery (Mzc)---	Surface layer good, thick, dark colored; subsoil poor, clayey; high water table.	Unsuitable; clayey---	Severe in subsoil and substratum, high shrink-swell potential, low bearing capacity, not suitable for flexible pavement.	Severe; high shrink-swell potential: high to very high compressibility; low shear strength; high water table.	Very high.
Morley: (MzdB, MzdB2, MzdC, MzdC2, MzdD, MzdD2, MzdE).	Surface layer good; subsoil poor, clayey.	Unsuitable; clayey---	Very severe in subsoil, high shrink-swell potential; severe in substratum, moderate shrink-swell potential, low bearing capacity when wet.	Moderate; fair shear strength; moderate compressibility; moderate to high shrink-swell potential; low bearing capacity.	Moderate.
(MzeC3, MzeD3)---	Surface layer and subsoil poor, clayey.	Unsuitable; clayey---	Very severe in subsoil, high shrink-swell potential; severe in substratum, moderate shrink-swell potential, low bearing capacity when wet.	Moderate; fair shear strength; moderate compressibility; moderate to high shrink-swell potential; low bearing capacity.	Moderate.
Mundelein (MzfA)----	Surface layer good; subsoil fair to poor, unstable on slopes; high water table.	Poor; poorly graded fine sand and, in places, layers of silt; high water table.	Severe in subsoil, low bearing capacity; moderate in substratum, relatively unstable.	Moderate; fairly low compressibility; moderately high susceptibility to frost heave; high water table, seepage, or both.	High.
Muskego (Mzg)------	Poor; soil is erodible and oxidizes rapidly.	Unsuitable; no sand and gravel present.	Very severe; organic material is unsuitable for subgrade.	Very severe; organic material is unsuitable for foundations.	Very high.

TABLE 4.—*Engineering interpretations for specified uses*—Continued

Soil series, land types, and map symbols [1]	Suitability as a source of—		Degree and kind of limitations affecting—		Corrosion potential for metal conduits
	Topsoil	Sand and gravel	Road subgrade	Foundations for low buildings	
Mussey (Mzk)	Surface layer good, dark colored; subsoil poor; high water table.	Good; substratum is poorly graded sand and gravel; high water table may hinder excavation.	Moderate in subsoil, moderate shrink-swell potential, low stability; slight in substratum when properly drained, very stable.	Moderate; very low compressibility; very low shrink-swell potential; good shear strength; high water table.	High.
Navan (Na)	Surface layer good, thick; subsoil poor; lower subsoil unstable on slopes; high water table.	Unsuitable; layers of sand and gravel in some places.	Moderate in subsoil, low stability and bearing capacity; severe in substratum, unstable.	Severe; moderate to high shrink-swell potential; high compressibility; poor shear strength; high water table.	Very high.
Ogden (Oc)	Poor; soil is erodible and oxidizes rapidly.	Unsuitable; no sand and gravel present.	Very severe; organic material is unsuitable for subgrade.	Very severe; organic material is unsuitable for foundations.	Very high.
Palms (Pa)	Poor; soil is erodible and oxidizes rapidly.	Unsuitable; no sand and gravel present.	Very severe; organic material is unsuitable for subgrade.	Very severe; organic material is unsuitable for foundations.	Very high.
Pella (Ph)	Surface layer good, dark colored, thick; subsoil poor, clayey; high water table.	Unsuitable; low sand and gravel content.	Very severe in subsoil and substratum, highly plastic, moderate shrink-swell potential.	Moderate; fair shear strength; moderate compressibility; high water table; may shrink when drained.	Very high.
Plano (Pt)	Surface layer good, dark colored, thick; subsoil fair, clayey, thick.	Good; substratum is poorly graded, stratified sand and gravel.	Severe in subsoil, moderate shrink-swell potential, low bearing capacity, highly elastic; slight in substratum, very stable.	Slight; very low compressibility; very low shrink-swell potential; good shear strength.	Moderate.
Radford (RaA)	Surface layer good, thick; subsoil poor, thick; high water table.	Poor; high water table; substratum contains pockets of sand and gravel in places.	Moderate to severe in subsoil, moderate shrink-swell potential; severe in substratum, relatively unstable.	Severe; moderate to high shrink-swell potential; fair shear strength; very high susceptibility to frost heave; high water table.	High.
Ringwood (RgB, RgC)	Surface layer good, dark colored, thick; subsoil poor; rock fragments in lower subsoil in places.	Poor; contains pockets of well-graded sand and gravel.	Severe in subsoil, moderate shrink-swell potential, low bearing capacity when wet; slight in substratum, good stability, low shrink-swell potential.	Slight; very low compressibility; low shrink-swell potential; good shear strength.	Moderate.
Rodman (Mapped only in complexes with Casco soils.)	Surface layer and subsoil unsuitable; very thin, cobbly.	Good; substratum is poorly graded, stratified sand and gravel; cobbly in places.	Slight in subsoil and substratum, good stability, very low shrink-swell potential.	Slight; good shear strength; negligible compressibility; very low shrink-swell potential.	Low.

Footnotes at end of table.

TABLE 4.—*Engineering interpretations for specified uses*—Continued

Soil series, land types, and map symbols [1]	Suitability as a source of—		Degree and kind of limitations affecting—		Corrosion potential for metal conduits
	Topsoil	Sand and gravel	Road subgrade	Foundations for low buildings	
Rollin (Rt)	Poor; soil is erodible and oxidizes rapidly.	Unsuitable; no sand and gravel present.	Very severe; organic material is unsuitable for subgrade.	Very severe; organic material is unsuitable for foundations.	Very high.
Rough broken land (Ry).	Unsuitable; very high clay content.	Unsuitable; no sand or gravel.	Severe; high shrink-swell potential, low bearing capacity.	Very severe; very steep; high shrink-swell potential.	Moderate.
St. Charles (SeA, SeB).	Surface layer good; substratum poor, clayey.	Good; substratum is poorly graded, stratified sand and gravel.	Severe in subsoil, moderate shrink-swell potential, low bearing capacity when wet; slight in substratum, very stable.	Slight; very low compressibility; low shrink-swell potential; good shear strength.	Moderate.
Sandy lake beaches (Sfb).	Unsuitable	Fair; poorly graded sand and some gravel.	Slight in substratum, stable under wheel loads when damp, no volume change, suitable for all types of pavement when confined, ground water level is governed by lake level.	Slight; low compressibility; no volume change on wetting and drying; may flow if saturated.	Low.
Sawmill, calcareous variant (Sg).	Surface layer good, dark colored, thick; subsoil good to fair, thick; high water table.	Unsuitable; high water table; layers of sand and gravel in places.	Severe in subsoil and substratum, relatively unstable, low bearing capacity.	Severe; subject to frost heave; low bearing capacity on thawing.	High.
Saylesville (ShA, ShB, ShC2).	Surface layer good, dark colored; subsoil poor, clayey; unstable on slopes.	Unsuitable; no sand or gravel.	Very severe in subsoil, high shrink-swell potential, very plastic; severe in substratum, relatively unstable, moderate shrink-swell potential.	Moderate; moderate to high shrink-swell potential; moderate compressibility; fair to poor shear strength.	Moderate.
Saylesville, dark surface variant (SkA, SkB).	Surface layer good, dark colored; subsoil poor, clayey; unstable on slopes.	Unsuitable; no sand or gravel.	Very severe in subsoil, high shrink-swell potential, very plastic; severe in substratum, relatively unstable.	Moderate; moderate to high shrink-swell potential; fair shear strength; moderate compressibility.	High.
Sebewa: (Sm)	Surface layer good, dark colored; thick; subsoil poor, thin; high water table.	Good; substratum is poorly graded, stratified sand and gravel; high water table hinders excavation.	Moderate in subsoil, moderate shrink-swell potential, low stability, very plastic; slight in substratum when drained, very stable under wheel loads.	Moderate; very low compressibility; very low shrink-swell potential; good shear strength; high water table.	High.

TABLE 4.—*Engineering interpretations for specified uses*—Continued

Soil series, land types, and map symbols [1]	Suitability as a source of—		Degree and kind of limitations affecting—		Corrosion potential for metal conduits
	Topsoil	Sand and gravel	Road subgrade	Foundations for low buildings	
Sebewa—Continued (So)	Surface layer good, thick; subsoil poor; lower subsoil unstable on slopes; high water table.	Unsuitable; layers of sand and gravel in some places.	Moderate in subsoil, low stability and bearing capacity; severe in substratum, unstable.	Severe; moderate to high shrink-swell potential; high compressibility; poor shear strength; high water table.	Very high.
Sisson: (SrB)	Surface layer fair, droughty; subsoil fair, unstable on slopes.	Poor; substratum contains layers of poorly graded fine sand and silt.	Severe in subsoil, moderate shrink-swell potential, low bearing capacity; moderate in substratum, relatively unstable.	Moderate; moderate shrink-swell potential; fairly low compressibility; moderate susceptibility to frost heave; loss of bearing capacity on thawing.	Moderate.
(SsB)	Surface layer fair, droughty; subsoil fair, unstable on slopes.	Unsuitable; thin layers of sand and gravel in some places.	Severe in subsoil, moderate shrink-swell potential; severe in substratum, unstable when wet.	Moderate; moderate to high shrink-swell potential; high compressibility; poor shear strength.	Moderate.
Symerton (SzA, SzB)	Surface layer good, thick, dark colored; subsoil fair; lower subsoil clayey and plastic.	Unsuitable; thin layers of sand and gravel in places.	Severe in subsoil, low stability and bearing capacity; severe in substratum, unstable when wet.	Moderate; moderate shrink-swell potential; poor shear strength; high compressibility.	Moderate to high.
Theresa (ThB)	Surface layer good; subsoil poor, clayey.	Poor; contains pockets of well-graded sand and gravel in the substratum.	Very severe in subsoil, high shrink-swell potential, low bearing capacity.	Slight; low compressibility; easy to compact; fair shear strength.	Moderate.
Varna (VaB, VaB2, VaC2).	Surface layer good, thick, dark colored; subsoil fair, clayey.	Unsuitable; clayey	Very severe in subsoil, high shrink-swell potential, low bearing capacity.	Moderate; fair shear strength; moderate compressibility; moderate to high shrink-swell potential; low bearing capacity.	Moderate.
Wallkill (Wa)	Surface layer good, thick, subsoil poor; organic material erodible; oxidizes rapidly; high water table.	Unsuitable; no sand and gravel present.	Very severe; organic material is unsuitable for subgrades.	Very severe; high water table; very low bearing capacity; special footings required.	Very high.
Warsaw: (WeA, WeB, WhA, WhB).	Surface layer good, dark colored, thick; subsoil poor; lower substratum gravelly in places.	Good; substratum poorly graded, stratified sand and gravel.	Moderate in subsoil, moderate shrink-swell potential, low bearing capacity when wet; slight in substratum, very stable.	Slight; very low compressibility; very low shrink-swell potential; good shear strength.	Moderate.
(WgA, WgB)	Surface layer good, thick, dark colored; subsoil fair; lower subsoil clayey and plastic.	Unsuitable; thin layers of sand and gravel in places.	Severe in subsoil, low stability and bearing capacity; severe in substratum, unstable when wet.	Moderate; moderate shrink-swell potential; poor shear strength.	Moderate to high.

TABLE 4.—*Engineering interpretations for specified uses*—Continued

Soil series, land types, and map symbols [1]	Suitability as a source of—		Degree and kind of limitations affecting—		Corrosion potential for metal conduits
	Topsoil	Sand and gravel	Road subgrade	Foundations for low buildings	
Wasepi: (WmA)	Surface layer good, somewhat droughty and erodible; subsoil poor, thin over sand and gravel; high water table.	Fair to good; substratum is poorly graded sand and pockets of gravel; high water table.	Slight in subsoil, low shrink-swell potential; slight in substratum, lacks stability under wheel loads when moist.	Moderate; very low compressibility; low shrink-swell potential; good shear strength; good bearing capacity; high water table, seepage, or both.	Moderate.
(WnA)	Surface layer good; subsoil poor; lower subsoil unstable on slopes.	Unsuitable; low sand and gravel content.	Slight in subsoil, moderate stability and bearing capacity when wet; severe in substratum, unstable when wet.	Severe; moderate to high shrink-swell potential; high compressibility; poor shear strength; high water table, seepage, or both.	High.
Wet alluvial land (Ww)	Fair; variable	Unsuitable; variable; high water table.	Severe; unstable; high water table.	Severe; unstable; high water table.	High.
Worthen (WyA)	Surface layer good, thick, dark colored; subsoil fair to poor, clayey in places.	Poor; substratum contains pockets of sand and gravel.	Severe in subsoil, high shrink-swell potential, low bearing capacity when wet; moderate in substratum, moderate shrink-swell potential, fair stability when wet.	Moderate; low compressibility; easy to compact; fair shear strength.	High.
Yahara (YaA)	Surface layer good; subsoil fair, unstable on slopes; high water table.	Poor; substratum in places contains layers of poorly graded fine sand and silt; high water table.	Severe in subsoil, moderate stability, low shrink-swell potential where sandy; moderate in substratum, relatively unstable.	Moderate; moderate shrink-swell potential; fairly low compressibility; moderately high susceptibility to frost heave; low bearing capacity on thawing; high water table, seepage, or both.	Moderate to low.
Zurich (ZuA, ZuB, ZuC2).	Surface layer good; subsoil fair to poor, unstable on slopes.	Poor; substratum in places contains layers of poorly graded fine sand and silt.	Severe in subsoil, moderate shrink-swell potential, low bearing capacity when wet; moderate in substratum, relatively unstable.	Moderate; moderate shrink-swell potential: fairly low compressibility; high susceptibility to frost heave; low bearing capacity on thawing.	Moderate.

[1] Interpretations are not given in this table for Clayey land (Cv), Loamy land (Lu), and Sandy and gravelly land (Sf). These land types are too variable to be rated or are not suitable for engineering uses.

TABLE 5.—*Engineering interpretations for farm uses*

Soil series, land types, and map symbols [1]	Soil features affecting—				
	Agricultural drainage	Irrigation	Terraces and diversions	Farm ponds	
				Reservoir area	Embankments
Adrian (Ac)	Moderately rapid permeability; substratum generally unstable.	High available water capacity; rapid intake rate; poorly drained; moderately deep over sand; nearly level.	Not applicable; little or no runoff.	Rapid permeability; high water table.	Organic soil, not suitable for embankments.
Ashkum (AtA)	Moderately slow permeability; high water table.	Poorly drained; high available moisture capacity; slow intake rate; nearly level.	Not applicable; little or no runoff.	High water table; moderately slow permeability.	Fair stability and compaction characteristics.
Aztalan (AuA, AzA, AzB).	Moderately slow permeability; seasonal high water table.	High available moisture capacity; moderate intake rate; somewhat poorly drained; nearly level and gently sloping.	Not applicable; little or no runoff.	Moderately slow permeability; seasonal high water table.	Semipervious; fair stability and compaction characteristics; medium compressibility.
Beecher (BcA)	Moderately slow permeability; seasonal high water table.	Moderate intake rate; high available moisture capacity; gently sloping.	Not applicable; little or no runoff.	Moderately slow permeability; seasonal high water table.	Semipervious; fair stability and compaction characteristics.
Blount (BlA)	Moderately slow permeability; seasonal high water table.	High available water capacity; deep soil; moderate intake rate; somewhat poorly drained; gently sloping.	Not applicable; little or no runoff.	Moderately slow permeability; seasonal high water table.	Semipervious; fair stability and compaction characteristics.
Boyer (BmB, BmC2, BnB).	Natural drainage is adequate.	Moderate available water capacity; nearly level to sloping.	Low stability; droughty; subject to soil blowing.	Permeability is moderately rapid in subsoil and rapid in substratum.	Pervious; fair stability and compaction characteristics; subject to piping.
Casco (CcB, CcC2, CeB, CeB2, CeC2, CeD2, CoC, CoD, CrC, CrD2, CrE). (For interpretations of Miami soil in mapping units CoC and CoD, see the Miami series. For interpretations of Rodman soil in units CrC, CrD2, and CrE, see the Rodman series.)	Natural drainage is adequate.	Moderate available water capacity; moderately deep over sand and gravel; moderate intake rate; gently sloping to moderately steep.	Moderately deep over sand and gravel; fair stability.	Permeability is moderate in subsoil and rapid in substratum.	Subsoil is semipervious and has fair stability and compaction characteristics; substratum is very pervious.

See footnotes at end of table.

TABLE 5.—*Engineering interpretations for farm uses*—Continued

Soil series, land types, and map symbols [1]	Soil features affecting—				
	Agricultural drainage	Irrigation	Terraces and diversions	Farm ponds	
				Reservoir area	Embankments
Colwood (Cw)-----	Moderate permeability; high water table.	Poorly drained; high available water capacity; deep soil; moderate intake rate; nearly level.	Not applicable; little or no runoff.	High water table; moderate permeability.	Semipervious; fair stability and compaction; piping hazard.
Conover (CyA)-----	Moderate and moderately slow permeability; seasonal high water table.	Somewhat poorly drained; high available water capacity; moderate and moderately slow permeability; gently sloping.	Not applicable; little or no runoff.	Seasonal high water table; moderate and moderately slow permeability.	Semipervious; good compaction and stability.
Darroch, neutral variant (DaA).	Seasonal high water table; moderate permeability.	Somewhat poorly drained; high available water capacity; moderate permeability; nearly level.	Not applicable; little or no runoff.	Moderately permeable.	Semipervious; fair stability and compaction.
Dorchester (Dh)----	Natural drainage is adequate.	Moderate intake rate; high available water capacity; nearly level.	Subject to flooding---	Subject to flooding; moderate permeability.	Pervious; fair stability and compaction characteristics.
Dresden (DrA)-----	Natural drainage is adequate.	Moderate available moisture capacity; moderate intake rate; moderately deep over sand and gravel; gently sloping.	Moderately deep over sand and gravel.	Permeability is moderate in subsoil and rapid in substratum.	Semipervious; fair stability and compaction characteristics.
Drummer (Dt)-----	Moderate permeability; high stability.	Poorly drained; high available water capacity; moderate intake rate; nearly level.	Not applicable; little or no runoff.	Poorly drained; moderate permeability.	Subsoil is semipervious; substratum is very pervious.
Elliott (EtA, EtB)---	Moderately slow permeability; seasonal high water table.	Somewhat poorly drained; high available water capacity; moderate intake rate; deep soil; nearly level and gently sloping.	Not applicable; little or no runoff.	Moderately slow permeability; seasonal high water table.	Semipervious; fair stability and compaction characteristics.
Fabius (FaA)-------	Moderate permeability.	Somewhat poorly drained; moderate available water capacity; moderate intake rate; gently sloping.	Not applicable; little or no runoff.	Moderate permeability; seasonal high water table.	Subsoil is semipervious and has fair stability and compaction characteristics; substratum is very pervious.
Fox (FmB, FmC2, FoA, FoB, FoC2, FrA, FrB, FsA, FsB).	Natural drainage is adequate.	Moderate available water capacity; moderate intake rate; nearly level to sloping.	Moderately deep over sand and gravel.	Permeability is moderate in subsoil and rapid in substratum.	Subsoil is semipervious and has good stability and compaction; substratum is very pervious in most Fox soils but is clayey in FrA and FrB.

TABLE 5.—*Engineering interpretations for farm uses*—Continued

Soil series, land types, and map symbols [1]	Soil features affecting—				
	Agricultural drainage	Irrigation	Terraces and diversions	Farm ponds	
				Reservoir area	Embankments
Granby (Gf, Gm)	High water table; rapid permeability; substratum unstable.	Poorly drained; low available water capacity; rapid intake rate; nearly level.	Not applicable; little or no runoff.	Rapid permeability; high water table.	Very pervious; poor stability; fair compaction characteristics.
Granby, brown subsoil variant (GnA)	Seasonal high water table; substratum unstable.	Somewhat poorly drained; low available water capacity; rapid intake rate; nearly level.	Not applicable; little or no runoff.	Rapid permeability; seasonal high water table.	Very pervious; poor stability; fair compaction characteristics.
Griswold (GsB, GsC2)	Natural drainage is adequate.	High available water capacity; deep soil; moderate intake rate; gently sloping and sloping.	Substratum has low stability.	Permeability is moderate in subsoil and rapid in substratum.	Semipervious; fair stability; fair compaction characteristics.
Hebron (HbB, HeA, HeB2, HeC2)	Natural drainage is adequate.	High available water capacity; deep soil; moderate intake rate; nearly level to sloping.	High stability	Moderately slow permeability.	Semipervious; good stability and compaction characteristics.
Hochheim (HmB, HmC2, HmD2)	Natural drainage is adequate.	High available water capacity; deep soil; moderate intake rate; gently sloping to moderately steep.	Shallow to loamy calcareous material.	Moderate permeability.	Semipervious; good stability and compaction characteristics.
Houghton (Ht)	Moderately rapid permeability; high water table.	Poorly drained; deep soil; high available water capacity; subject to soil blowing; nearly level.	Not applicable; little or no runoff.	Moderately rapid permeability; high water table.	Organic soil; use for embankments not feasible.
Kane (KaA, KhA)	Seasonal high water table; moderate permeability.	Somewhat poorly drained; high available water capacity; deep soil; moderate intake rate; nearly level.	Not applicable; little or no runoff.	Permeability is moderate in subsoil and rapid in substratum; seasonal high water table.	Subsoil is semipervious and has good stability and compaction characteristics; substratum is very pervious in KaA and is clayey in KhA.
Knowles (KmB)	Natural drainage is adequate.	Moderate available water capacity; moderately deep over bedrock; moderate intake rate; gently sloping.	Moderately deep over bedrock.	Moderately permeable; fractured dolomite at depth of 20 to 40 inches.	Semipervious; good stability and compaction characteristics.
Lawson, calcareous variant (Lp)	Seasonal high water table; moderately permeable.	Somewhat poorly drained; moderate water intake rate; very high available water capacity; nearly level.	Frequently flooded; low stability.	Seasonal high water table; moderate permeability; subject to flooding.	Pervious; poor stability and compaction characteristics.

See footnotes at end of table.

TABLE 5.—*Engineering interpretations for farm uses*—Continued

Soil series, land types, and map symbols [1]	Soil features affecting—				
	Agricultural drainage	Irrigation	Terraces and diversions	Farm ponds	
				Reservoir area	Embankments
Lorenzo (LyB)------	Natural drainage is adequate.	Low available water capacity; rapid intake rate; shallow over sand and gravel; gently sloping.	Shallow over sand and gravel.	Permeability is rapid in shallow substratum.	Very pervious.
Markham (MeB, MeB2, MeC2).	Natural drainage is adequate.	High available water capacity; moderately slow permeability; gently sloping and sloping.	Highly stable-------	Moderately slow permeability.	Semipervious; highly stable.
Martinton (MgA)---	Seasonal high water table; slowly permeable.	High available water capacity; slow permeability; gently sloping.	Not applicable; little or no runoff.	Slowly permeable; seasonal high water table.	Semipervious; fair stability and compaction characteristics.
Matherton (MkA, MlA).	Moderate permeability; seasonal high water table.	Somewhat poorly drained; moderate intake rate; nearly level and gently sloping.	Not applicable; little or no runoff.	Permeability moderate in subsoil and rapid in substratum; seasonal high water table.	Subsoil is semipervious and has fair stability and compaction characteristics; substratum is very pervious in MkA and is clayey in MlA.
McHenry (MpB, MpC2).	Natural drainage is adequate.	Moderate intake rate; high available water capacity; gently sloping and sloping.	High stability------	Moderately permeable.	Semipervious; fair stability and compaction characteristics.
Miami (MwB, MwC2, MwD2, MxB, MxC2, MxD2, MyB, MyC2).	Natural drainage is adequate.	Moderate intake rate; high available water capacity; deep soil; gently sloping to moderately steep.	Calcareous loam substratum.	Moderately permeable.	Semipervious; good stability and compaction characteristics.
Montgomery (Mzc)-	Slow permeability; high water table; fair stability.	Poorly drained; slow permeability; high available water capacity; nearly level.	Not applicable; little or no runoff.	Slowly permeable; poorly drained.	Semipervious; fair stability and compaction characteristics.
Morley (MzdB, MzdB2, MzdC, MzdC2, MzdD, MzdD2, MzdE, MzeC3, MzeD3).	Natural drainage is adequate.	High available water capacity; deep soil; slow water intake rate; gently sloping to steep.	Clayey subsoil------	Moderately slow permeability.	Semipervious; fair stability and compaction characteristics.
Mundelein (MzfA)--	Seasonal high water table; moderately permeable.	Somewhat poorly drained; high available water capacity; moderate permeability; nearly level.	Not applicable; little or no runoff.	Moderate permeability; high water table.	Subsoil is semipervious and has good stability and compaction; substratum is pervious; piping hazard.
Muskego (Mzg)----	Moderate permeability.	Poorly drained, high available water capacity; rapid water intake rate; nearly level.	Not applicable; little or no runoff.	Moderate permeability; high water table.	Organic material, not suitable for embankments.

TABLE 5.—*Engineering interpretations for farm uses*—Continued

Soil series, land types, and map symbols [1]	Soil features affecting—				
	Agricultural drainage	Irrigation	Terraces and diversions	Farm ponds	
				Reservoir area	Embankments
Mussey (Mzk)	Moderate permeability; high water table.	Poorly drained; moderate available water capacity; moderate intake rate; nearly level.	Not applicable; little or no runoff.	Moderately permeable subsoil; rapidly permeable substratum.	Subsoil is semipervious and has fair stability and compaction; substratum is very pervious.
Navan (Na)	High water table; slowly permeable.	Poorly drained; high available water capacity; moderate intake rate; nearly level.	Not applicable; little or no runoff.	Slowly permeable; high water table.	Semipervious; fair stability and compaction.
Ogden (Oc)	High water table; slowly permeable substratum.	Poorly drained; rapid water intake rate; high available water capacity; nearly level.	Not applicable; little or no runoff.	Slowly permeable substratum; poorly drained.	Organic material, unsuitable for embankments.
Palms (Pa)	High water table; moderately permeable substratum.	Poorly drained; rapid water intake rate; very high available water capacity; nearly level.	Not applicable; little or no runoff.	Moderately permeable substratum; poorly drained.	Organic material, unsuitable for embankments.
Pella (Ph)	High water table; moderately permeable.	Poorly drained; very high available water capacity; moderate intake rate; nearly level.	Not applicable; little or no runoff.	Moderately permeable; poorly drained.	Semipervious; fair stability and compaction.
Plano (Pt)	Natural drainage is adequate.	Very high available water capacity; deep soil; nearly level.	Good stability	Permeability is moderate in subsoil and very rapid in substratum.	Subsoil is semipervious and has good stability and compaction; substratum is very pervious.
Radford (RaA)	Subject to flooding	Subject to flooding; high available water capacity; moderately permeable; nearly level.	Not applicable; little or no runoff.	Subject to flooding; moderately permeable.	Semipervious; fair stability and compaction.
Ringwood (RgB, RgC).	Natural drainage is adequate.	High available water capacity; deep soil; moderate intake rate; gently sloping and sloping.	Sandy loam substratum.	Moderate permeability.	Semipervious; good stability and compaction.
Rodman (Mapped only in complexes with Casco soils.)	Natural drainage is excessive.	Low available water capacity; shallow to sand and gravel; rapid intake rate; gently sloping to steep.	Shallow to sand and gravel.	Rapid permeability	Very pervious; stony.
Rollin (Rt)	High water table; slowly permeable substratum.	Poorly drained; very high available water capacity; rapid water intake rate; nearly level.	Not applicable; little or no runoff.	Slowly permeable; high water table.	Organic material, unsuitable for embankments.

See footnotes at end of table.

TABLE 5.—*Engineering interpretations for farm uses*—Continued

Soil series, land types, and map symbols [1]	Soil features affecting—				
	Agricultural drainage	Irrigation	Terraces and diversions	Farm ponds	
				Reservoir area	Embankments
Rough broken land (Ry).	Natural drainage is adequate or excessive.	Very steep	Very steep	Very steep; permeability variable.	Semipervious; fair stability.
St. Charles (SeA, SeB).	Natural drainage is adequate.	High available water capacity; deep soil; moderate water intake rate; nearly level and gently sloping.	High stability	Moderately permeable subsoil; rapidly permeable substratum.	Subsoil is semipervious and has good stability and compaction; substratum is very pervious.
Sandy and gravelly land (Sf).	Natural drainage is adequate or excessive.	Low available water water capacity; little or no soil material.	Little or no soil material.	Rapidly permeable	Very pervious.
Sandy lake beaches (Sfb).	Subject to flooding	Low available water capacity and fertility; subject to flooding.	Not applicable; little or no runoff.	Unstable; rapidly permeable.	Very pervious; unstable.
Sawmill, calcareous variant (Sg).	High water table; moderately permeable.	Poorly drained; very high available water capacity; moderate intake rate; nearly level.	Not applicable; little or no runoff.	Moderate permeability.	Semipervious; fair stability and compaction.
Saylesville (ShA, ShB, ShC2).	Natural drainage is adequate.	High available water capacity; slow water intake rate; nearly level to sloping.	Fair stability; moderately slow permeability; medium surface runoff.	Moderately slow permeability.	Semipervious; fair stability; good compaction characteristics
Saylesville, dark surface variant (SkA, SkB).	Natural drainage is adequate.	High available water capacity; slow water intake rate; nearly level and gently sloping.	Fair stability; moderately slow permeability; medium surface runoff.	Moderately slow permeability.	Semipervious; fair stability; good compaction characteristics.
Sebewa (Sm, So)	High water table; moderately permeable.	Poorly drained; high available water capacity; moderate permeability; nearly level.	Not applicable; little or no runoff.	Poorly drained; moderate permeability.	Fair stability; good compaction; pervious.
Sisson (SrB, SsB)	Natural drainage is adequate.	High available water capacity; moderate water intake rate; deep soil; gently sloping.	Low stability; very erodible.	Moderate permeability.	Subsoil is semipervious and has fair stability and compaction; substratum is pervious, has poor stability, and is subject to piping.
Symerton (SzA, SzB).	Natural drainage is adequate.	High available water capacity; moderate water intake rate; nearly level and gently sloping.	High stability	Moderately slow permeability.	Semipervious; good stability and compaction.
Theresa (ThB)	Natural drainage is adequate.	High available water capacity; moderate water intake rate; deep soil; gently sloping.	Substratum strongly calcareous.	Moderate permeability.	Subsoil is semipervious and has good stability and compaction; substratum is pervious.

TABLE 5.—*Engineering interpretations for farm uses*—Continued

Soil series, land types, and map symbols [1]	Soil features affecting—				
	Agricultural drainage	Irrigation	Terraces and diversions	Farm ponds	
				Reservoir area	Embankments
Varna (VaB, VaB2, VaC2).	Natural drainage is adequate.	Moderately slow permeability; very high available water capacity; gently sloping and sloping.	Subsoil clayey	Moderately slow permeability.	Semipervious; fair stability and compaction.
Wallkill (Wa)	High water table; moderately permeable; frequent flooding.	Poorly drained; very high available water capacity; moderate intake rate; nearly level.	Not applicable; little or no runoff.	Mineral material has moderate permeability; organic material has moderately rapid permeability; high water table.	Subsoil is semipervious and has fair stability and compaction; organic substratum is not suitable for embankments.
Warsaw (WeA, WeB, WgA, WgB, WhA, WhB).	Natural drainage is adequate.	Moderate available water capacity; moderate water intake rate; moderately deep soil; nearly level and gently sloping.	Substratum is sand and gravel.	Moderately permeable subsoil; rapidly permeable substratum.	Subsoil is semipervious and has fair stability and compaction; substratum is very pervious in most Warsaw soils but is clayey in WgA and WgB.
Wasepi (WmA, WnA).	Seasonal high water table; moderately permeable.	Somewhat poorly drained; moderate available water capacity; moderate permeability; nearly level.	Not applicable; little or no runoff.	High water table; subsoil moderately permeable; substratum rapidly permeable.	Subsoil is semipervious and has good stability and compaction; substratum is very pervious in WmA and is clayey in WnA.
Worthen (WyA)	Natural drainage is adequate.	Very high available water capacity; deep soil; moderate water intake rate; nearly level.	Not applicable; little or no runoff.	Moderate permeability.	Semipervious; poor stability and compaction.
Yahara (YaA)	Seasonal high water table; moderate permeability; substratum unstable.	Somewhat poorly drained; high available water capacity; moderate permeability; nearly level.	Not applicable; little or no runoff.	Seasonal high water table; moderate permeability.	Semipervious; poor stability and compaction.
Zurich (ZuA, ZuB, ZuC2).	Natural drainage is adequate.	High available water capacity; moderate intake rate; nearly level to sloping.	Fair stability	Moderate permeability.	Semipervious; fair stability.

[1] Interpretations are not given in this table for Alluvial land (Am), Clayey land (Cv), Loamy land (Lu), Marsh (Mf), and Wet alluvial land (Ww). These land types are not suitable for engineering uses or have characteristics that are too variable to rate.

TABLE 6.—*Soil limitations for selected nonfarm uses*

Soil series, land types, and map symbols [1]	Residential developments	Onsite sewage disposal systems	Commercial and light industrial developments	Roads and airports
Adrian (Ac)	Very severe; high water table; subject to shrinkage; erodible.	Very severe; high water table.	Very severe; high water table; high compressibility and instability; erodible.	Very severe; high water table; high compressibility and instability; very low bearing capacity.
Alluvial land (Am)	Very severe; on flood plains and subject to overflow.	Very severe; subject to overflow.	Severe; soil material liquefies when saturated; subject to frost heave; low bearing strength; flood hazard.	Severe; low stability and low bearing capacity; subject to frost heave.
Ashkum (AtA)	Severe; low bearing capacity; high shrink-swell potential; high water table.	Very severe; high water table; slow permeability.	Severe; low bearing capacity; high shrink-swell potential; high water table.	Severe; high shrink-swell potential; low bearing capacity; high water table.
Aztalan (AuA, AzA, AzB)	Moderate; moderate shrink-swell potential; seasonal high water table.	Very severe; seasonal high water table; slow permeability.	Severe; moderate shrink-swell potential; high compressibility; low shear strength; seasonal high water table.	Severe; subsoil has low stability and bearing capacity; subject to slippage and frost heave; seasonal high water table.
Beecher (BcA)	Moderate; low bearing capacity; high shrink-swell potential; seasonal high water table.	Very severe; seasonal high water table; moderately slow permeability.	Severe; seasonal high water table; high shrink-swell potential; low bearing capacity; subject to frost heave.	Severe; seasonal high water table; moderate to high shrink-swell potential; low bearing capacity; subject to frost heave.
Blount (BlA)	Moderate; low bearing capacity; high shrink-swell potential; seasonal high water table.	Very severe; seasonal high water table; moderately slow permeability.	Severe; seasonal high water table; high shrink-swell potential; low bearing capacity; subject to frost heave.	Severe; seasonal high water table; high shrink-swell potential; low bearing capacity; subject to frost heave.
Boyer (BmB, BmC2, BnB).	Slight; droughty; erodible.	Moderate; possible contamination of ground water.	Slight on slopes of 1 to 6 percent, moderate on slopes of 6 to 12 percent; cuts and fills are difficult to vegetate.	Slight; cuts and fills are difficult to stabilize.
Casco (CcB, CcC2, CeB, CeB2, CeC2, CeD2, CoC, CoD, CrC, CrD2, CrE). (For limitations of Miami soils in mapping units CoC and CoD, see the Miami series. For limitations of the Rodman soils in units CrC, CrD2, and CrE, see the Rodman series.)	Slight on slopes of 2 to 12 percent, moderate on slopes of 12 to 20 percent; severe on slopes of more than 20 percent; slightly droughty; sloping soils are erodible.	Moderate on slopes of 2 to 12 percent, severe on slopes of more than 12 percent.	Slight on slopes of 2 to 6 percent, moderate on slopes of 6 to 12 percent, severe on slopes of more than 12 percent; cuts are difficult to vegetate.	Slight on slopes of 2 to 12 percent, moderate on slopes of more than 12 percent; cuts and fills are difficult to stabilize.
Colwood (Cw)	Severe; high water table; basements are wet.	Very severe; high water table.	Severe; high water table; subject to frost heave, liquefaction, and piping.	Severe; high water table; subject to liquefaction, piping, and frost heave.
Conover (CyA)	Moderate; seasonal high water table.	Very severe; seasonal high water table.	Moderate; seasonal high water table; subject to frost heave.	Moderate; seasonal high water table; subject to frost heave; subsoil has moderate shrink-swell potential and low bearing capacity.

See footnotes at end of table.

TABLE 6.—*Soil limitations for selected nonfarm uses*—Continued

Soil series, land types, and map symbols [1]	Residential developments	Onsite sewage disposal systems	Commercial and light industrial developments	Roads and airports
Darroch, neutral variant (DaA).	Moderate; soil liquefies readily; seasonal high water table.	Very severe; seasonal high water table.	Severe; seasonal high water table; low bearing capacity; subject to liquefaction, piping, and frost heave.	Moderate; seasonal high water table; subject to piping and frost heave.
Dorchester (Dh)	Severe; soil liquefies readily; low bearing capacity; subject to frost heave.	Very severe; frequent overflow.	Very severe; frequent overflow; low bearing capacity; subject to liquefaction, piping, and frost heave.	Very severe; frequent overflow; low bearing capacity; subject to liquefaction, piping, and frost heave.
Dresden (DrA)	Slight; sloping areas are erodible.	Moderate; danger of contaminating ground water.	Slight	Slight.
Drummer (Dt)	Severe; high water table; basements are wet.	Very severe; high water table.	Severe; high water table; subject to frost heave.	Severe; high water table; subject to frost heave; subsoil has low bearing capacity.
Elliott (EtA, EtB)	Moderate; low bearing capacity when wet; seasonal high water table; basements may be wet.	Very severe; seasonal high water table; moderately slow permeability.	Severe: seasonal high water table; low bearing capacity; high shrink-swell potential; subject to frost heave.	Moderate; seasonal high water table; low bearing capacity; subject to frost heave.
Fabius (FaA)	Moderate; seasonal high water table.	Very severe; seasonal high water table.	Moderate; seasonal high water table.	Moderate; seasonal high water table.
Fox: (FmB, FmC2, FoA, FoB, FoC2, FsA, FsB.)	Slight; sloping soils are erodible.	Moderate; danger of contaminating ground water.	Slight on slopes of 0 to 6 percent, moderate on slopes of 6 to 12 percent; sloping soils are erodible.	Slight; subsoil has moderate shrink-swell potential; sloping soils are erodible.
(FrA, FrB)	Moderate; sloping soils are erodible; clayey substratum has high shrink-swell potential and low bearing capacity.	Moderate; clayey substratum has slow permeability.	Moderate; clayey substratum has high shrink-swell potential; high compressibility and low shear strength.	Moderate; clayey substratum has high shrink-swell potential and low bearing capacity.
Granby (Gf, Gm)	Severe; high water table; basements are wet; flotation of pipes.	Very severe; high water table.	Severe; high water table; subject to liquefaction and piping.	Severe; high water table; subject to liquefaction and piping.
Granby, brown subsoil variant (GnA).	Moderate; seasonal high water table.	Very severe; seasonal high water table.	Moderate; seasonal high water table; sand may flow when saturated; erodible.	Moderate; seasonal high water table; sand is subject to liquefaction and piping.
Griswold (GsB, GsC2)	Slight; soils are erodible	Slight	Slight; soils are erodible	Slight; subsoil has moderate shrink-swell potential and low bearing capacity.
Hebron (HbB, HeA, HeB2, HeC2).	Moderate; sloping soils are erodible; low bearing capacity; moderate to high shrink-swell potential.	Severe; slow permeability.	Moderate; moderate to high shrink-swell potential; low shear strength; high compressibility.	Moderate; substratum has low bearing capacity; moderate to high shrink-swell potential.
Hochheim (HmB, HmC2, HmD2).	Slight on slopes of 2 to 12 percent, moderate on slopes of 12 to 20 percent; soils are erodible.	Slight on slopes of 2 to 6 percent, moderate on slopes of 6 to 12 percent, severe on slopes of more than 12 percent; soils are erodible.	Slight on slopes of 2 to 6 percent, moderate on slopes of 6 to 12 percent, severe on slopes of more than 12 percent; soils are erodible.	Slight on slopes of 2 to 12 percent, moderate on slopes of more than 12 percent; subsoil has moderate shrink-swell potential; soils are erodible.

See footnotes at end of table.

TABLE 6.—*Soil limitations for selected nonfarm uses*—Continued

Soil series, land types, and map symbols [1]	Residential developments	Onsite sewage disposal systems	Commercial and light industrial developments	Roads and airports
Houghton (Ht)	Very severe; subject to shrinkage; very low bearing capacity; high water table.	Very severe; high water table.	Very severe; high compressibility; unstable; high water table.	Very severe; high water table; high compressibility; unstable; very low bearing capacity.
Kane:				
(KaA)	Moderate; seasonal high water table.	Very severe; seasonal high water table.	Moderate; seasonal high water table; subject to frost heave.	Moderate; seasonal high water table; subject to frost heave.
(KhA)	Moderate; seasonal high water table; clayey substratum has moderate shrink-swell potential.	Severe; seasonal high water table; slow permeability.	Severe; seasonal high water table; clayey substratum has moderate shrink-swell potential; high compressibility; low shear strength.	Severe; subsoil has low stability and bearing capacity; clayey substratum has moderate shrink-swell potential; subject to slippage and frost heave; seasonal high water table.
Knowles (KmB)	Slight; bedrock may hinder excavation.	Severe; bedrock near the surface; possible contamination of ground water.	Moderate; bedrock may hinder excavation.	Moderate; subject to frost heave; bedrock may hinder excavation.
Lawson, calcareous variant (Lp).	Very severe; subject to frost heave; seasonal high water table; frequent overflow.	Very severe; frequent overflow.	Very severe; subject to liquefaction and piping; frequent overflow; seasonal high water table; low bearing capacity.	Very severe; frequent overflow; seasonal high water table; subject to liquefaction, piping, and frost heave; low bearing capacity.
Lorenzo (LyB)	Slight; soil is erodible	Moderate; danger of contaminating ground water.	light; cuts and fills may be difficult to vegetate.	Slight; cuts and fills may be difficult to vegetate.
Markham (MeB, MeB2, MeC2).	Moderate; moderate to high shrink-swell potential; low bearing capacity.	Severe; moderately slow permeability.	Moderate; low bearing capacity; moderate to high shrink-swell potential.	Moderate; low bearing capacity; moderate to high shrink-swell potential.
Marsh (Mf)	Very severe; flooded most of the time.	Very severe; flooded most of the time.	Very severe; flooded most of the time.	Very severe; flooded most of the time.
Martinton (MgA)	Moderate; high shrink-swell potential; low bearing capacity; seasonal high water table.	Very severe; seasonal high water table; slow permeability.	Severe; high shrink-swell potential; low bearing capacity; seasonal high water table.	Severe; high shrink-swell potential; low bearing capacity; seasonal high water table; subject to seepage and slippage.
Matherton:				
(MkA)	Moderate; seasonal high water table.	Very severe; seasonal high water table.	Moderate; seasonal high water table.	Moderate; seasonal high water table.
(MlA)	Moderate; seasonal high water table; clayey substratum has low bearing capacity; high shrink-swell potential.	Very severe; seasonal high water table; slow permeability.	Severe; seasonal high water table; clayey substratum has low bearing capacity; high shrink-swell potential; low shear strength; high compressibility.	Moderate; seasonal high water table; clayey substratum has low bearing capacity and high shrink-swell potential; subject to frost heave.
McHenry (MpB, MpC2)	Slight; soils are erodible; subject to frost heave.	Slight on slopes of 2 to 6 percent, moderate on slopes of 6 to 12 percent.	Slight on slopes of 2 to 6 percent, moderate on slopes of 6 to 12 percent; soils are erodible; subject to frost heave.	Slight; soils are erodible; subsoil has low bearing capacity.
Miami: (MwB, MwC2, MwD2, MyB, MyC2).	Slight on slopes of 2 to 12 percent, moderate on slopes of 12 to 20 percent; soils are erodible.	Slight on slopes of 2 to 6 percent, moderate on slopes of 6 to 12 percent, severe on slopes of more than 12 percent.	Slight on slopes of 2 to 6 percent, moderate on slopes of 6 to 12 percent, severe on slopes of more than 12 percent.	Slight on slopes of 2 to 12 percent, moderate on slopes of more than 12 percent; subsoil has moderate shrink-swell potential and moderate bearing capacity.

TABLE 6.—*Soil limitations for selected nonfarm uses*—Continued

Soil series, land types, and map symbols [1]	Residential developments	Onsite sewage disposal systems	Commercial and light industrial developments	Roads and airports
Miami—Continued (MxB, MxC2, MxD2).	Slight on slopes of 2 to 12 percent, moderate on slopes of 12 to 20 percent; soils are erodible.	Slight on slopes of 2 to 6 percent, moderate on slopes of 6 to 12 percent, severe on slopes of more than 12 percent.	Slight on slopes of 2 to 6 percent, moderate on slopes of 6 to 12 percent, severe on slopes of more than 12 percent; soils are erodible.	Slight on slopes of 2 to 12 percent, moderate on slopes of more than 12 percent; soils are erodible.
Montgomery (Mzc)	Severe; high water table; basements are wet; high shrink-swell potential.	Very severe; high water table; slow permeability.	Severe; high water table; high shrink-swell potential; low bearing capacity.	Very severe; high water table; high shrink-swell potential; low bearing capacity; low shear strength.
Morley: (MzdB, MzdB2, MzdC, MzdC2, MzdD, MzdD2, MzdE, MzeC3, MzeD3).	Moderate on slopes of 2 to 12 percent, severe on slopes of more than 12 percent; low bearing capacity.	Severe; moderately slow permeability.	Moderate on slopes of 2 to 6 percent, severe on slopes of more than 6 percent; low bearing capacity; moderate to high shrink-swell potential.	Moderate on slopes of 2 to 12 percent, severe on slopes of more than 12 percent; low bearing capacity; subject to frost heave.
Mundelein (MzfA)	Moderate; soil is erodible; liquefies readily; subject to frost heave; low bearing capacity; seasonal high water table.	Very severe; seasonal high water table.	Moderate; seasonal high water table; subject to frost heave and liquefaction; low bearing capacity.	Moderate; seasonal high water table; subject to frost heave, seepage, and liquefaction; low bearing capacity.
Muskego (Mzg)	Very severe; high water table; compressible; very low bearing capacity.	Very severe; high water table.	Very severe; high water table; subject to shrinkage; unstable.	Very severe; high water table; subject to shrinkage; very low bearing capacity.
Mussey (Mzk)	Severe; high water table; basements are wet; flotation of pipes.	Very severe; high water table.	Severe; high water table.	Severe; high water table.
Navan (Na)	Severe; substratum has low bearing capacity; high water table; basements are wet.	Very severe; high water table; slow permeability.	Severe; high water table; low bearing capacity; moderate to high shrink-swell potential.	Severe; high water table; low bearing capacity; subject to liquefaction, piping, and frost heave.
Ogden (Oc)	Very severe; subject to shrinkage; high water table.	Very severe; high water table.	Very severe; high water table; silty clay and silty clay loam have high shrink-swell potential.	Very severe; high water table; muck has high compressibility and very low bearing capacity.
Palms (Pa)	Very severe; subject to shrinkage; high water table.	Very severe; high water table.	Very severe; high water table; muck has high compressibility and instability.	Very severe; high water table; muck has high compressibility and very low bearing strength.
Pella (Ph)	Severe; soil liquefies readily; low bearing capacity; subject to frost heave; high water table; basements may be wet.	Very severe; high water table.	Severe; high water table; moderate shrink-swell potential; subject to liquefaction and piping.	Severe; high water table; moderate shrink-swell potential; low bearing capacity; subject to liquefaction, piping, and frost heave.
Plano (Pt)	Slight; sloping areas are erodible; subject to frost heave.	Slight; possible contamination of ground water.	Slight; sloping areas are erodible; subject to frost heave.	Moderate; subject has low bearing capacity; subject to frost heave.

See footnotes at end of table.

TABLE 6.—*Soil limitations for selected nonfarm uses*—Continued

Soil series, land types, and map symbols [1]	Residential developments	Onsite sewage disposal systems	Commercial and light industrial developments	Roads and airports
Radford (RaA)	Severe; low bearing capacity; seasonal high water table; occasional overflow.	Very severe; seasonal high water table; occasional overflow.	Severe; seasonal high water table; low bearing capacity; subject to piping, liquefaction, and occasional overflow.	Severe; seasonal high water table; low bearing capacity; subject to liquefaction, piping, frost heave, and occasional overflow.
Ringwood (RgB, RgC)	Slight; soils are erodible	Slight	Slight; soils are erodible	Slight; subsoil has high shrink-swell potential and low bearing capacity.
Rodman (Mapped only in complexes with Casco soils.)	Moderate on slopes of 6 to 12 percent, severe on slopes of more than 12 percent; soils are droughty; cobbly in many places.	Moderate on slopes of 6 to 12 percent, severe on slopes of more than 12 percent.	Moderate on slopes of 6 to 12 percent, severe on slopes of more than 12 percent; droughty; cobbly in many places.	Moderate; droughty; cuts and fills are difficult to vegetate.
Rollin (Rt)	Very severe; high water table; subject to shrinkage.	Very severe; high water table.	Very severe; high water table; high compressibility; unstable.	Very severe; high water table; high compressibility; unstable; very low bearing capacity.
Rough broken land (Ry)	Severe; steep areas are unstable.	Very severe; slopes are too steep.	Severe; steep areas are unstable; high shrink-swell potential.	Severe; steep areas are unstable; subject to slippage and frost heave.
St. Charles (SeA, SeB)	Slight; subject to frost heave.	Slight	Slight; low bearing capacity; subject to frost heave.	Moderate; low bearing capacity; subject to frost heave, liquefaction, piping, and slippage.
Sandy lake beaches (Sfb)	Moderate; high water table.	Very severe; high water table.	Moderate; low compressibility; good shear strength; liquefies and flows when saturated; high water table.	Moderate; low shrink-swell potential; stable under wheel loads when moist.
Sawmill, calcareous variant (Sg).	Very severe; frequent overflow.	Very severe; frequent overflow.	Very severe; frequent overflow; low bearing capacity; subject to liquefaction, piping, and frost heave.	Very severe; frequent overflow; low bearing capacity; subject to liquefaction, piping, and frost heave.
Saylesville (ShA, ShB, ShC2).	Moderate; slow permeability; high shrink-swell potential.	Moderate; slow permeability.	Moderate on slopes of 0 to 6 percent, severe on slopes of more than 6 percent; high shrink-swell potential; subject to frost heave.	Moderate; high shrink-swell potential; low bearing capacity; subject to frost heave, slippage, and seepage.
Saylesville, dark surface variant (SkA, SkB).	Moderate; sloping areas are erodible; high shrink-swell potential; low bearing capacity; subject to frost heave.	Moderate; slow permeability.	Moderate; high shrink-swell potential; subject to frost heave.	Moderate; high shrink-swell potential; low bearing capacity; subject to frost heave and slippage.
Sebewa:				
(Sm)	Severe; high water table; basements are wet.	Very severe; high water table.	Severe; high water table	Severe; high water table; subsoil has low bearing capacity; subject to frost heave.
(So)	Severe; high water table; clayey substratum has moderate to high shrink-swell potential and low bearing capacity; basements are wet.	Very severe; high water table; slow permeability.	Severe; high water table; clayey substratum has high compressibility; low shear strength; high shrink-swell potential; low bearing capacity.	Severe; high water table; clayey substratum has high compressibility; high shrink-swell potential and low bearing capacity.

TABLE 6.—*Soil limitations for selected nonfarm uses*—Continued

Soil series, land types, and map symbols [1]	Residential developments	Onsite sewage disposal systems	Commercial and light industrial developments	Roads and airports
Sisson: (SrB)	Moderate; soil liquefies readily; subject to frost heave; low bearing capacity.	Moderate; maintaining filter fields is difficult.	Moderate; low bearing capacity; subject to frost heave, liquefaction, and piping; erodible on slopes.	Severe; low bearing capacity; subject to frost heave, liquefaction, piping, and slippage.
(SsB)	Moderate; substratum has high shrink-swell potential and low bearing capacity.	Severe; slow permeability.	Moderate; high shrink-swell potential; low shear strength; high compressibility.	Severe; substratum has low bearing capacity and high shrink-swell potential.
Symerton (SzA, SzB)	Moderate; sloping areas are erodible; high shrink-swell potential; low bearing capacity; subject to slippage.	Severe; slow permeability.	Moderate; erodible on slopes; high shrink-swell potential; low shear strength; high compressibility; subject to slippage.	Moderate; high shrink-swell potential; low bearing capacity; high compressibility; subject to frost heave, slippage, and seepage.
Theresa (ThB)	Slight; soil is erodible	Slight	Slight; subject to frost heave; subsoil has moderate shrink-swell potential.	Slight; subsoil has moderate shrink-swell potential and low bearing capacity; subject to frost heave.
Varna (VaB, VaB2, VaC2).	Moderate; soils are erodible; high shrink-swell potential; low bearing capacity; subject to frost heave.	Severe; slow permeability.	Moderate on slopes of 2 to 6 percent, severe on slopes of more than 6 percent; high shrink-swell potential; low bearing capacity; subject to frost heave.	Moderate; high shrink-swell potential; low bearing capacity; subject to frost heave.
Wallkill (Wa)	Very severe; high water table; subject to shrinkage on drying; frequent overflow; basements are wet.	Very severe; high water table; frequent overflow.	Very severe; high water table; unstable; frequent overflow.	Very severe; high water table; high compressibility; frequent overflow; low bearing capacity.
Warsaw: (WeA, WeB, WhA, WhB).	Slight; subject to frost heave.	Slight	Slight; subject to frost heave.	Slight; subsoil has low bearing capacity.
(WgA, WgB)	Moderate; sloping areas are erodible; clayey substratum has moderate shrink-swell potential; low bearing capacity; subject to slippage.	Severe; clayey substratum has slow permeability.	Moderate; sloping areas are erodible: moderate shrink-swell potential; clayey substratum has low shear strength and high compressibility and is subject to slippage.	Moderate; moderate shrink-swell potential; clayey substratum has low bearing capacity; high compressibility; subject to frost heave, slippage, and seepage.
Wasepi: (WmA)	Severe; high water table	Very severe; high water table.	Severe; high water table	Severe; high water table.
(WnA)	Severe; seasonal high water table; clayey substratum has high shrink-swell potential.	Very severe; seasonal high water table; slow permeability.	Severe; seasonal high water table; clayey substratum has high shrink-swell potential; high compressibility and low shear strength.	Severe; seasonal high water table; subsoil has low stability and bearing capacity; clayey substratum has moderate to high shrink-swell potential and is subject to slippage and frost heave.
Wet alluvial land (Ww)	Very severe; high water table; subject to overflow.	Very severe; high water table; subject to overflow.	Very severe; subject to high water table and overflow.	Very severe; high water table; subject to overflow.

TABLE 6.—*Soil limitations for selected nonfarm uses*—Continued

Soil series, land types, and map symbols [1]	Residential developments	Onsite sewage disposal systems	Commercial and light industrial developments	Roads and airports
Worthen (WyA)	Moderate; occasional overflow.	Severe; occasional overflow.	Severe; occasional overflow; low bearing capacity when wet; subject to liquefaction, piping, and frost heave.	Severe; occasional overflow; low bearing capacity; subject to frost heave, liquefaction, and piping.
Yahara (YaA)	Moderate; seasonal high water table; soil liquefies readily; low bearing capacity; subject to frost heave.	Very severe; seasonal high water table.	Moderate; seasonal high water table; subject to liquefaction, piping, and frost heave.	Severe; seasonal high water table; low bearing capacity; subject to liquefaction, piping, seepage, and frost heave.
Zurich (ZuA, ZuB, ZuC2)	Moderate; soil liquefies readily; subject to frost heave; low bearing capacity.	Moderate; sloping soils are erodible.	Moderate; soil liquefies readily; low bearing capacity; subject to frost heave; erodible on slopes.	Severe; low bearing capacity; subject to frost heave, liquefaction, piping, and slippage.

[1] Limitations are not given in this table for Clayey land (Cv), Loamy land (Lu), and Sandy and gravelly land (Sf). These land types are too variable to be rated or are not suitable for engineering uses.

Estimated engineering properties

In table 3 the soil series and map symbols for each series are listed and estimates of properties significant in engineering are given. The estimates are for undisturbed soil. They are based on data shown in table 2, on test data from similar soils in other counties, on comparison with similar soils that have been tested, and on study of the soils in the field. Alluvial land, Clayey land, Loamy land, Marsh, Rough broken land, Sandy and gravelly land, Sandy lake beaches, and Wet alluvial land are not listed in the table. These land types are too variable to be rated or are not suitable for engineering uses.

The dominant USDA texture, and the Unified and AASHO classifications, are shown in table 3 for each of the major soil horizons. Also shown are the estimated percentages of material passing through the various sieves.

Estimated depth to water table refers to the highest level at which the ground water stands for a significant period of time. Ordinarily, free water stands at this level in spring or during a prolonged wet period. The depth to water table is related to the natural drainage of the soils, as follows: 0 to 1 foot, *poorly drained or very poorly drained;* 1 foot to 3 feet, *somewhat poorly drained;* more than 3 feet, *moderately well drained to excessively drained.*

Depth to bedrock has been omitted from the table, because the only soils in these counties that are less than 5 feet deep to bedrock are the Knowles. In the Knowles soils, bedrock occurs at a depth of 20 to 30 inches.

The permeability of a soil horizon is the rate at which water moves through the undisturbed soil material when it is saturated. The estimates are in inches per hour.

Available water capacity refers to the amount of water that can be stored in the soil for the use of plants. It is expressed in table 3 as inches of water per inch of soil.

Reaction refers to the acidity or alkalinity of the soil, expressed in terms of pH. A pH of 7.0 is neutral; values of less than 7.0 indicate acidity, and values of more than 7.0 indicate alkalinity. The reaction given in table 3 is the normal range for that soil when it is unlimed.

Shrink-swell potential is an indication of the volume changes that can be expected with changes in moisture content. It depends largely on the amount and type of clay and the organic-matter content in the soil.

Engineering interpretations

Tables 4, 5, and 6 give engineering interpretations for the soils in Kenosha and Racine Counties. In table 4 the soils are rated according to their suitability as sources of topsoil and of sand and gravel. Also listed are soil limitations that affect the use of soils as subgrades for roads and as supports for foundations, as well as ratings of the corrosion potential for metal conduits. Table 5 lists soil features affecting agricultural drainage, irrigation, terraces and diversions, and farm ponds. Table 6 shows soil limitations that affect residential developments, onsite sewage disposal systems, commercial and light industrial developments, and roads and airports.

In tables 4 and 6, a rating of *slight* means that the soil has no limitations or has limitations for a given use that are easily overcome. A rating of *moderate* means that the soil has limitations for a given use that can be overcome by average management and careful design. A rating of *severe* means that the soil has limitations for a given use that are difficult to overcome. A rating of *very severe* means that the soil has limitations that generally preclude its use for a given purpose.

The ratings given the soils in table 4 as sources of topsoil and of sand and gravel are *good*, *fair*, *poor*, and *unsuitable*. Topsoil refers specifically to soil material that is used as topdressing for roadbanks, parks, gardens, and lawns. In the column showing suitability as a source of sand and gravel, the ratings are based on the character of the soil profile to a depth of 5 feet.

Ratings of the limitations that affect use as subgrade material for roads are determined by the characteristics that enable soils to support base courses, including curbs and gutters, in highway construction.

The limitations of an undisturbed soil for use as support for low buildings depend mainly on bearing capac-

ity and expansion potential. The ratings in table 4 are for the substratum only, because it is assumed that the base of the foundation is below the depth at which the soil is subject to shrink-swell action, root penetration, and frost heaving.

Also shown in the table is the corrosion potential of the soils for metal conduits laid underground. Generally, the characteristics of soils that are most corrosive to metal pipes are poor aeration, a high pH value, a high content of salt, and a high content of moisture. The corrosion potential for concrete conduits is not shown in table 4, because the potential is low for all the soils in Kenosha and Racine Counties.

Table 5 lists soil features that affect selected farm uses.

Agricultural drainage is affected mainly by depth to the water table and by soil permeability. In some soils the substratum is unstable, and tile drains are difficult to maintain in these soils.

The most important features affecting the use of soils for irrigation are available water capacity, the rate of water intake, natural drainage, and slope. Available water capacity is the total quantity of water that will not drain away but can be taken up by plant roots to a depth of 5 feet or to bedrock, whichever is less. The ratings are *very high*, more than 9 inches; *high*, 6 to 9 inches; *medium*, 3 to 6 inches; and *low*, less than 3 inches. The rate of water intake is an evaluation of the combined effects of the initial infiltration rate and the soil permeability.

Also shown in table 5 are features of the soils that determine suitability for terraces and diversions. The main features are slope, soil depth, and soil stability. Depth must be adequate for the excavation of a shallow channel that will carry flowing water. Stability affects the ease or difficulty of maintaining terraces and diversions.

In addition, the table lists soil features that influence the construction of the reservoir area and the embankment of farm ponds. Among the features that affect reservoir areas are soil permeability, depth to bedrock, depth and permeability of the substratum, and depth to the water table. Affecting embankments are compaction characteristics, soil stability, and perviousness of the material when compacted. Perviousness refers to water permeability of the soil material and is expressed in feet per day. The ratings are *very pervious*, more than 20 feet per day; *pervious*, 3 to 20 feet per day; *semipervious*, 0.003 foot to 3 feet per day; and *impervious*, less than 0.003 foot per day. The features considered for reservoir areas are for undisturbed soils, whereas those for embankments are for soil materials that have been disturbed.

Table 6 rates the soils of the county according to their limitations for various nonfarm uses.

The major properties that limit use of the soils for residential developments are slope, drainage, soil texture, and depth to bedrock. Also considered in rating the soils is the ease or difficulty of establishing a plant cover.

Limitations of the soils for disposing of sewage effluent through onsite disposal systems indicate the capacity of the soil material to absorb and dispose of effluent without contaminating the surrounding areas. The properties that affect this use include soil permeability, the percolation rate, depth to water table, drainage, the hazard of flooding, depth to bedrock, and slope.

Commercial and light industrial developments are areas in which the buildings are no more than three stories high and have at least 2,500 square feet of floor space on any one level. Only the substratum is rated, for the buildings generally rest on this part of the soil. Among the characteristics that affect the ratings are soil texture, bearing capacity, shear strength, shrink-swell potential, compressibility, soil stability, susceptibility to liquefaction and piping, depth to bedrock, and depth to water table. Slope can be a major limitation restricting industrial developments where it is more than 12 percent and exceeds 200 feet in length.

In the location and construction of roads and airports, the properties that affect the performance of soils are texture, presence and thickness of organic material, depth to bedrock, presence of stones and boulders, suitability of the soil as a source of embankment material, depth to water table, soil stability, bearing capacity, susceptibility to frost heave, erodibility, and hazard of flooding.

Woodland and Urban Trees

In 1836, when the first white settlers were plowing the prairie and cutting oak trees for cabins, 60 to 65 percent of the area that is now Kenosha and Racine Counties was covered with trees, mainly oaks growing in sparse or open stands. Today, woodland occupies less than 7 percent of the two counties.

About two-thirds of the woodland is oak, principally red oak and white oak. Other important trees are hickory, red maple, sugar maple, basswood, and cherry.

The largest wooded areas are in the western part of the two counties, mainly in the townships of Brighton, Randall, Wheatland, and Salem in Kenosha County, and the townships of Waterford, Norway, Dover, and Burlington in Racine County. Most of the wooded areas are privately owned woodlots, nearly half of which are heavily grazed.

Most woodland in these counties is poorly stocked and contains an insufficient number of valuable trees. Commonly, the poorly stocked areas are unfavorable for planting because they are brushy, wet, rocky, or steep. The average annual growth rate is only 0.15 cord of wood per year.

Markets are currently available for saw logs and veneer processed from the principal tree species. The demand for fuelwood has decreased markedly in recent years, and few farmers are cutting trees for this use, but the demand for fuelwood may become important again as more wood is used in fireplaces. Because the trees cut for fuel ordinarily are inferior ones, the reduced demand for firewood has nearly eliminated this means by which timber stands are improved. The acreage used for producing Christmas trees is expanding, and an even larger acreage may be used for this purpose in the future.

Because of a growing need to use woodland for purposes other than timber production, harvesting trees for wood products is likely to be of secondary importance in the future. Increasingly, wooded areas are used for large estates and parkways, as well as for campgrounds and other recreational areas. In some places woodlots

are in great demand for housing developments. Consequently, careful planning is needed to halt the trend toward a further decline in the forested acreage of the two counties.

Suitability of the soils for urban trees

To assist homeowners, community planners, and others concerned with parks, parkways, streets, and homesites, the soils of Kenosha and Racine Counties have been placed in 10 groups according to their suitability for urban trees. Each group is made up of soils that are suited to similar species and require similar management.

Listed in table 7 are the 10 urban trees suitability groups of the two counties. To find the names of soils in any given group, refer to the "Guide to Mapping Units" at the back of this survey.

TABLE 7.—*Suitability of the soils for urban trees*

[Dashed lines indicate that the soils are severely limited by characteristics that make them unsuitable for most trees]

Urban trees suitability group	Suitable trees			
	Shade trees	Lawn trees	Street trees	Hedges, screens, and windbreaks
Group 1: Moderately deep to deep, moderately well drained, medium-textured soils on uplands.	Sugar maple, red maple, American beech, northern red oak, white oak, basswood, hackberry, white ash, sycamore, bur oak.	Mountain-ash, blue beech, white ash, paper birch, river birch, Russian-olive, pin oak, juneberry, Kentucky coffeetree, red pine, white pine, white spruce, black cherry, ironwood.	Norway maple, pin oak, thornless honeylocust, bitternut hickory, ironwood, basswood, white ash.	Redcedar, lilac, Lombardy poplar, white-cedar, white pine, white spruce.
Group 2: Moderately deep to deep, moderately well drained to well drained soils that have a medium-textured surface layer and a fine-textured subsoil.	Sugar maple, red maple, basswood, American beech, white oak, bur oak, white ash, northern catalpa, hackberry, sycamore, green ash, swamp white oak.	Paper birch, blue beech, mountain-ash, black cherry, white pine, ironwood, white-cedar, pin oak, white spruce.	Bitternut hickory, pin oak, thornless honeylocust, green ash, ironwood.	White-cedar, redcedar, Lombardy poplar, white spruce.
Group 3: Moderately deep to deep, moderately coarse textured soils that are somewhat excessively drained.	Scarlet oak, bur oak, hackberry, black oak.	Paper birch, redcedar, red pine, white pine.	Ironwood	Redcedar.
Group 4: Coarse-textured soils that are excessively drained and droughty.	Black oak, scarlet oak	Red pine, white pine	Hackberry	Redcedar, jack pine.
Group 5: Thin, medium-textured to moderately coarse textured soils that are somewhat excessively drained.	Northern red oak, white oak, bur oak, sugar maple, American beech, red maple.	White pine, paper birch, Russian-olive, juneberry.	Bitternut hickory, Norway maple, green ash, ironwood.	Redcedar, white pine, white-cedar, white spruce.
Group 6: Somewhat poorly drained to very poorly drained, moderately coarse textured to fine-textured soils on uplands.	Swamp white oak, hackberry, red maple, basswood, green ash, white ash.	White spruce, hemlock, paper birch, mountain-ash.	Green ash, basswood, red maple.	White-cedar, white spruce.
Group 7: Somewhat poorly drained to poorly drained, moderately coarse textured soils on flats and in drainageways and depressions.	Silver maple, swamp white oak.	White spruce	Black ash	White-cedar, white spruce.
Group 8: Somewhat poorly drained to very poorly drained soils that formed in local alluvium or occupy flood plains.	Swamp white oak, red maple, basswood, hackberry, green ash, sycamore.	Paper birch, white-cedar, balsam fir, white spruce, mountain-ash.	Pin oak, red maple	White-cedar.
Group 9: Organic soils	Silver maple, red maple, white ash.	White-cedar, balsam fir, white spruce.		White-cedar.
Group 10: Miscellaneous land types having variable characteristics.				

Also named in the table are trees that are suitable as shade trees, as lawn trees, as street trees, and as hedges, screens, and windbreaks. Trees listed as shade trees are suitable for parks, parkways, green belts, and large house lots. Those listed as lawn trees are of use mainly as ornamentals or specimen trees. Those listed as street trees are considered suitable for city streets of medium width.

Descriptions of the Soils

This section describes the soil series and mapping units of Kenosha and Racine Counties. The acreage and proportionate extent of each mapping unit are given in table 8.

The procedure in this section is first to describe the soil series, and then the mapping units in that series. For each soil series, a profile of a soil representative of the series is described. Thus, to get full information on any one mapping unit, it is necessary to read the description of the soil series to which it belongs. In the description of each series, the last paragraph compares the soils of that series with the soils of one or more other series that commonly occur nearby or are similar in some respects.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Alluvial land, Marsh, and Sandy lake beaches, for example, do not belong to a soil series, but, nevertheless, are listed in alphabetical order along with the soil series.

Following the name of each mapping unit, there is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description is the capability unit, recreation group, wildlife group, and urban trees group in which the mapping unit has been placed. The page on which each group is described can be found by referring to the "Guide to Mapping Units" at the back of this survey.

The color of each soil horizon is described in words, such as yellowish brown, but it can also be indicated by symbols for the hue, value, and chroma, such as 10YR 5/6. These symbols, called Munsell color notations (*6*), are used by soil scientists to evaluate the color of the soil precisely. Unless otherwise indicated, the colors given in the following descriptions are for the soils when moist.

Many terms used in the soil descriptions and in other sections of the survey are defined in the Glossary.

Adrian Series

The Adrian series consists of poorly drained, organic soils that developed from sedge and grass remains and are underlain by sandy material at a depth of less than 42 inches. These nearly level soils are on flats and in depressions. The native vegetation was water-tolerant grasses and sedges.

In a typical profile the upper 18 inches of the surface layer is medium acid to slightly acid, black muck. It is underlain by a medium acid to slightly acid, very dark brown mucky peat subsurface layer that is 14 inches thick.

The underlying material is neutral medium sand mottled with yellowish brown.

These soils have moderately high available moisture capacity and very slow internal drainage. Where drainage practices are used, roots readily penetrate to the water table or to the underlying material. The fertility of these soils is low.

Typical profile of Adrian muck in a cultivated field (SW¼SW¼ sec. 15, T. 4 N., R. 20 E., Racine County):

1—0 to 18 inches, black (N 2/0) muck; moderate, medium, granular structure; very friable; medium to slightly acid; clear, wavy boundary.

2—18 to 32 inches, very dark brown (10YR 2/2) mucky peat; weak, coarse, subangular blocky structure; very friable; medium to slightly acid; abrupt, wavy boundary.

IIC—32 to 60 inches, gray (5Y 5/1) medium sand; single grain; loose; many distinct mottles of yellowish brown (10YR 5/4); neutral.

The color of the surface layer ranges from black (N 2/0) to very dark brown (10YR 2/2). The reaction of the soil ranges from medium acid to neutral. The underlying material varies from fine sand to coarse sand and is at a depth of 12 to 42 inches.

The Adrian soils differ from the Ogden soils in being underlain by sandy material rather than clayey material.

Adrian muck (Ac) (0 to 2 percent slopes).—This soil occupies flats and depressions. Surface runoff is very slow to ponded. Included with this soil in mapping are small areas of Houghton muck.

The use of this soil for crops is severely limited because sand is at a depth of 42 inches or less. This soil has low fertility and, if drained, is subject to subsidence and wind damage. (Capability unit IVw–7; recreation group 8; wildlife group 9; urban trees group 9)

Alluvial land (Am) lies on the flood plains of streams. It consists of moderately well drained alluvium that was recently deposited by floodwater. The material generally is stratified and varies widely in texture and color. This land commonly occurs with Wet alluvial land, the Dorchester soils, and the Lawson soils, calcareous variant. Small areas of all these soils were included in mapping.

Alluvial land has slow internal drainage. Its fertility and available moisture capacity are variable. Seasonally, the water table is at a depth of 3 to 5 feet. Occasional flooding is a moderate limitation that affects use of this land for crops. Also, streambank cutting is a hazard in areas bordering stream channels. (Capability unit IIIw–5; recreation group 7; wildlife group 1; urban trees group 1)

Ashkum Series

The Ashkum series consists of poorly drained soils that developed from clay loam or silty clay loam glacial till. These nearly level to gently sloping soils occupy flats, drainageways, and depressions. The native vegetation was water-tolerant grasses.

In a typical profile the surface layer is mildly alkaline, friable, black silty clay loam about 13 inches thick. A few brown mottles appear at a depth of 8 inches.

The subsoil is about 24 inches thick. The upper part is mildly alkaline, dark grayish-brown silty clay loam mottled with strong brown. The middle part is calcareous, olive-gray heavy silty clay loam mottled with dark brown. The lower part of the subsoil is calcareous, olive-gray heavy silty clay loam that has brown to strong-brown mottles.

TABLE 8.—*Approximate acreage and proportionate extent of the soils*

Mapping unit	Kenosha County		Racine County		Total area	
	Acres	Percent	Acres	Percent	Acres	Percent
Adrian muck	473	0.3	628	0.3	1,101	0.3
Alluvial land	297	.2	243	.1	540	.1
Ashkum silty clay loam, 0 to 3 percent slopes	16,180	9.3	16,014	7.4	32,194	8.2
Aztalan loam, 0 to 2 percent slopes	2,660	1.5	1,598	.7	4,258	1.1
Aztalan loam, 2 to 6 percent slopes	1,511	.9	3,083	1.4	4,594	1.2
Aztalan sandy loam, 1 to 3 percent slopes	15	(1)	772	.4	787	.2
Beecher silt loam, 1 to 3 percent slopes	7,461	4.3	3,476	1.6	10,937	2.8
Blount silt loam, 1 to 3 percent slopes	1,840	1.1	5,187	2.4	7,027	1.8
Boyer loamy sand, 1 to 6 percent slopes	524	.3	199	.1	723	.2
Boyer loamy sand, 6 to 12 percent slopes, eroded	87	(1)	259	.1	346	.1
Boyer sandy loam, 2 to 6 percent slopes	384	.2	250	.1	634	.2
Casco loam, 2 to 6 percent slopes	502	.3	2,006	.9	2,508	.6
Casco loam, 2 to 6 percent slopes, eroded	345	.2	1,215	.6	1,560	.4
Casco loam, 6 to 12 percent slopes, eroded	1,752	1.0	2,370	1.1	4,122	1.1
Casco loam, 12 to 20 percent slopes, eroded	1,372	.8	1,176	.5	2,548	.6
Casco sandy loam, 2 to 6 percent slopes	103	.1	126	.1	229	.1
Casco sandy loam, 6 to 12 percent slopes, eroded	152	.1	178	.1	330	.1
Casco-Miami loams, 6 to 12 percent slopes	454	.2	----------	----------	454	.1
Casco-Miami loams, 12 to 20 percent slopes	375	.2	----------	----------	375	.1
Casco-Rodman complex, 6 to 12 percent slopes	29	(1)	262	.1	291	.1
Casco-Rodman complex, 12 to 20 percent slopes, eroded	1,328	.8	1,240	.6	2,568	.6
Casco-Rodman complex, 20 to 35 percent slopes	1,296	.7	3,244	1.5	4,540	1.2
Clayey land	2,055	1.2	290	.1	2,345	.6
Colwood silt loam	717	.4	437	.2	1,154	.3
Conover silt loam, 1 to 3 percent slopes	497	.3	340	.2	837	.2
Darroch fine sandy loam, neutral variant, 0 to 3 percent slopes	133	.1	225	.1	358	.1
Dorchester silt loam	263	.1	----------	----------	263	.1
Dresden loam, 1 to 3 percent slopes	948	.5	721	.3	1,669	.4
Drummer silt loam, gravelly substratum	892	.5	763	.4	1,655	.4
Elliott silty clay loam, 0 to 2 percent slopes	2,460	1.4	2,020	.9	4,480	1.1
Elliott silty clay loam, 2 to 6 percent slopes	12,784	7.3	9,868	4.6	22,652	5.8
Fabius loam, 1 to 3 percent slopes	185	.1	250	.1	435	.1
Fox loam, 0 to 2 percent slopes	410	.2	845	.4	1,255	.3
Fox loam, 2 to 6 percent slopes	2,588	1.5	4,107	1.9	6,695	1.7
Fox loam, 6 to 12 percent slopes, eroded	409	.2	851	.4	1,260	.3
Fox loam, clayey substratum, 0 to 2 percent slopes	233	.1	163	.1	396	.1
Fox loam, clayey substratum, 2 to 6 percent slopes	675	.4	881	.4	1,556	.4
Fox sandy loam, 1 to 6 percent slopes	223	.1	806	.4	1,029	.3
Fox sandy loam, 6 to 12 percent slopes, eroded	652	.4	155	.1	807	.2
Fox silt loam, 0 to 2 percent slopes	1,271	.7	1,470	.7	2,741	.7
Fox silt loam, 2 to 6 percent slopes	4,584	2.6	2,733	1.1	7,317	1.9
Granby fine sandy loam	559	.3	266	.1	825	.2
Granby fine sandy loam, loamy substratum	15	(1)	353	.2	368	.1
Granby fine sandy loam, brown subsoil variant, 0 to 3 percent slopes	1,281	.7	----------	----------	1,281	.3
Griswold loam, 2 to 6 percent slopes	----------	----------	310	.1	310	.1
Griswold loam, 6 to 12 percent slopes, eroded	----------	----------	252	.1	252	.1
Hebron loam, 0 to 2 percent slopes	553	.3	772	.4	1,325	.3
Hebron loam, 2 to 6 percent slopes, eroded	1,208	.7	4,676	2.2	5,884	1.5
Hebron loam, 6 to 12 percent slopes, eroded	325	.2	342	.2	667	.2
Hebron sandy loam, 2 to 6 percent slopes	301	.2	934	.4	1,235	.3
Hochheim loam, 2 to 6 percent slopes	----------	----------	718	.3	718	.2
Hochheim loam, 6 to 12 percent slopes, eroded	35	(1)	621	.3	656	.2
Hochheim loam, 12 to 20 percent slopes, eroded	28	(1)	227	.1	255	.1
Houghton muck	4,471	2.6	13,603	6.3	18,074	4.6
Kane loam, 1 to 3 percent slopes	1,038	.6	543	.3	1,581	.4
Kane silt loam, clayey substratum, 1 to 3 percent slopes	476	.3	678	.3	1,154	.3
Knowles silt loam, 2 to 6 percent slopes	----------	----------	100	(1)	100	(1)
Lawson silt loam, calcareous variant	216	.1	111	.1	327	.1
Loamy land	1,346	.8	754	.3	2,100	.5
Lorenzo loam, 2 to 6 percent slopes	120	.1	656	.3	776	.2
Markham silt loam, 2 to 6 percent slopes	11,711	6.7	10,247	4.8	21,958	5.6
Markham silt loam, 2 to 6 percent slopes, eroded	5,708	3.3	1,960	.9	7,668	2.0
Markham silt loam, 6 to 12 percent slopes, eroded	1,985	1.1	959	.4	2,944	.7
Marsh	441	.2	1,298	.6	1,739	.4
Martinton silt loam, 1 to 3 percent slopes	1,589	.9	2,942	1.4	4,531	1.2
Matherton loam, 1 to 3 percent slopes	995	.6	1,545	.7	2,540	.6
Matherton loam, clayey substratum, 1 to 3 percent slopes	626	.3	444	.2	1,070	.3
McHenry silt loam, 2 to 6 percent slopes	87	(1)	520	.2	607	.1
McHenry silt loam, 6 to 12 percent slopes, eroded	184	.1	82	(1)	266	.1
Miami loam, 2 to 6 percent slopes	891	.5	454	.2	1,345	.3
Miami loam, 6 to 12 percent slopes, eroded	1,118	.6	1,070	.5	2,188	.6
Miami loam, 12 to 20 percent slopes, eroded	123	.1	532	.2	655	.2

TABLE 8.—*Approximate acreage and proportionate extent of the soils*—Continued

Mapping unit	Kenosha County		Racine County		Total area	
	Acres	Percent	Acres	Percent	Acres	Percent
Miami loam, sandy loam substratum, 2 to 6 percent slopes	1,656	.9	784	.4	2,440	.6
Miami loam, sandy loam substratum, 6 to 12 percent slopes, eroded	526	.3	978	.5	1,504	.4
Miami loam, sandy loam substratum, 12 to 20 percent slopes, eroded	245	.1	795	.4	1,040	.3
Miami silt loam, 2 to 6 percent slopes	2,011	1.2	1,329	.6	3,340	.9
Miami silt loam, 6 to 12 percent slopes, eroded	630	.4	433	.2	1,063	.3
Montgomery silty clay	6,459	3.7	3,776	1.8	10,235	2.6
Morley silt loam, 2 to 6 percent slopes	2,932	1.7	33,515	15.5	36,447	9.3
Morley silt loam, 2 to 6 percent slopes, eroded	6,582	3.8	9,307	4.3	15,889	4.1
Morley silt loam, 6 to 12 percent slopes	1,620	.9	1,820	.8	3,440	.9
Morley silt loam, 6 to 12 percent slopes, eroded	3,693	2.1	5,129	2.4	8,822	2.3
Morley silt loam, 12 to 20 percent slopes	330	.2	850	.4	1,180	.3
Morley silt loam, 12 to 20 percent slopes, eroded	321	.2	1,111	.5	1,432	.4
Morley silt loam, 20 to 30 percent slopes	55	(1)	403	.2	458	.1
Morley soils, 6 to 12 percent slopes, severely eroded	50	(1)	424	.2	474	.1
Morley soils, 12 to 20 percent slopes, severely eroded	125	.1	387	.2	512	.1
Mundelein silt loam, 1 to 3 percent slopes	333	.2	811	.4	1,144	.3
Muskego muck	282	.2	89	(1)	371	.1
Mussey loam	187	.1	258	.1	445	.1
Navan silt loam	4,732	2.7	2,068	1.0	6,800	1.7
Ogden muck	1,016	.6	1,264	.6	2,280	.6
Palms muck	1,047	.6	1,086	.5	2,133	.5
Pella silt loam	1,858	1.1	2,318	1.1	4,176	1.1
Plano silt loam, gravelly substratum	563	.3	151	.1	714	.2
Radford silt loam, 0 to 3 percent slopes	255	.1	435	.2	690	.2
Ringwood silt loam, 2 to 6 percent slopes	----------	----------	1,287	.6	1,287	.3
Ringwood silt loam, 6 to 12 percent slopes	----------	----------	231	.1	231	.1
Rollin muck	122	.1	287	.1	409	.1
Rough broken land	5	(1)	177	.1	182	(1)
St. Charles silt loam, gravelly substratum, 0 to 2 percent slopes	554	.3	134	.1	688	.2
St. Charles silt loam, gravelly substratum, 2 to 6 percent slopes	216	.1	84	(1)	300	.1
Sandy and gravelly land	246	.1	270	.1	516	.1
Sandy lake beaches	198	.1	116	.1	314	.1
Sawmill silt loam, calcareous variant	231	.1	288	.1	519	.1
Saylesville silt loam, 0 to 2 percent slopes	352	.2	348	.2	700	.2
Saylesville silt loam, 2 to 6 percent slopes	694	.4	1,606	.7	2,300	.6
Saylesville silt loam, 6 to 12 percent slopes, eroded	289	.2	309	.1	598	.1
Saylesville silt loam, dark surface variant, 0 to 2 percent slopes	63	(1)	104	(1)	167	(1)
Saylesville silt loam, dark surface variant, 2 to 6 percent slopes	191	.1	281	.1	472	.1
Sebewa silt loam	2,625	1.5	2,288	1.1	4,913	1.3
Sebewa silt loam, clayey substratum	999	.6	721	.3	1,720	.4
Sisson fine sandy loam, 1 to 6 percent slopes	556	.3	927	.4	1,483	.4
Sisson fine sandy loam, clayey substratum, 1 to 6 percent slopes	104	.1	125	.1	229	.1
Symerton loam, 0 to 2 percent slopes	89	.1	203	.1	292	.1
Symerton loam, 2 to 6 percent slopes	799	.4	584	.3	1,383	.3
Theresa silt loam, 2 to 6 percent slopes	-----	---	320	.1	320	.1
Varna silt loam, 2 to 6 percent slopes	10,654	6.1	6,486	3.0	17,140	4.4
Varna silt loam, 2 to 6 percent slopes, eroded	2,543	1.5	1,287	.6	3,830	1.0
Varna silt loam, 6 to 12 percent slopes, eroded	272	.1	209	.1	481	.1
Wallkill silt loam	240	.1	274	.1	514	.1
Warsaw loam, 0 to 2 percent slopes	225	.1	625	.3	850	.2
Warsaw loam, 2 to 6 percent slopes	1,207	.7	1,084	.5	2,291	.6
Warsaw loam, clayey substratum, 0 to 2 percent slopes	92	.1	61	(1)	153	(1)
Warsaw loam, clayey substratum, 2 to 6 percent slopes	151	.1	149	.1	300	.1
Warsaw silt loam, 0 to 2 percent slopes	420	.2	980	.5	1,400	.3
Warsaw silt loam, 2 to 6 percent slopes	331	.2	720	.3	1,051	.3
Wasepi sandy loam, 1 to 3 percent slopes	251	.1	57	(1)	308	.1
Wasepi sandy loam, clayey substratum, 1 to 3 percent slopes	837	.5	1,123	.5	1,960	.5
Wet alluvial land	1,236	.7	758	.4	1,994	.5
Worthen silt loam, 0 to 3 percent slopes	91	.1	602	.3	693	.2
Yahara fine sandy loam, 1 to 3 percent slopes	117	.1	629	.3	746	.2
Zurich silt loam, 0 to 2 percent slopes	154	.1	288	.1	442	.1
Zurich silt loam, 2 to 6 percent slopes	205	.1	521	.2	726	.2
Zurich silt loam, 6 to 12 percent slopes, eroded	57	(1)	129	.1	186	(1)
Gravel pits	975	.6	916	.4	1,891	.5
Borrow pits	272	.1	151	.1	423	.1
Total	174,720	100.0	215,680	100.0	390,400	100.0

[1] Less than 0.05 percent.

The underlying material is calcareous, gray and yellowish-brown silty clay loam mottled with brown and strong brown. It contains a few dolomite pebbles and shale chips.

The Ashkum soils have a high available moisture capacity, ponded to slow surface runoff, moderately slow permeability, and very slow internal drainage. These soils are in poor tilth. If cultivated or pastured when wet, they tend to puddle and then dry into hard clods. Roots penetrate to the water table, which, seasonally, is less than 1 foot below the soil surface. The fertility in these soils is high.

Typical profile of Ashkum silty clay loam, 0 to 3 percent slopes, in a cultivated area (NW¼NW¼ sec. 8, T. 1 N., R. 22 E., Kenosha County):

Ap—0 to 8 inches, black (N 2/0) silty clay loam; massive because of tillage; breaks to moderate to strong, medium, granular structure; friable when moist, slightly hard when dry; plant roots plentiful; some earthworm holes and casts; mildly alkaline; abrupt, smooth boundary.

A1g—8 to 13 inches, black (N 2/0) silty clay loam; moderate, medium, granular structure; friable; abundant plant roots; plentiful earthworm holes and casts; few, faint, fine mottles of strong brown (7.5YR 5/6); mildly alkaline; clear, wavy boundary.

B21g—13 to 19 inches, dark grayish-brown (2.5Y 4/2) heavy silty clay loam; weak, medium, prismatic structure that breaks to moderate to strong, fine, angular blocky structure; hard when dry and plastic when wet; many, fine, distinct mottles of strong brown (7.5YR 5/6); clay films on ped faces; plentiful plant roots; few old root channels and crawfish holes; mildly alkaline; clear, wavy boundary.

B22g—19 to 24 inches, olive-gray (5Y 5/2) heavy silty clay loam; moderate, medium, prismatic structure that breaks to moderate to strong, medium, angular blocky structure; hard when dry and slightly plastic when wet; plant roots plentiful; few old sedge root channels and crawfish holes; many, medium, distinct mottles of dark brown (7.5YR 4/4); calcareous; gradual, irregular boundary.

B3—24 to 37 inches, olive-gray (5Y 5/2) heavy silty clay loam till; moderate, medium, prismatic structure that breaks to moderate, medium, angular blocky structure; hard when dry and slightly plastic when wet; few plant roots; many old sedge root channels and few crawfish holes; many, medium, distinct mottles of dark brown to brown (7.5YR 4/4) and strong brown (7.5YR 5/6); clay films on vertical ped faces; a 2-inch dolomitic pebble band lies at upper boundary suggesting an old eroded surface; few, soft, lime concretions; dolomitic pebbles and shale chips; highly calcareous; gradual, irregular boundary.

IICg—37 to 47 inches, gray (5Y 5/1) and yellowish-brown (10YR 5/6) (about 50 percent of each) silty clay loam; massive in place, but breaks to weak, coarse, prismatic structure; hard when dry and slightly plastic when wet; many, medium, distinct mottles of dark brown to brown (7.5YR 4/4) and strong brown (7.5YR 5/6); few crawfish holes and many old sedge root channels; few dolomite pebbles and shale chips; highly calcareous.

The surface soil is dominantly silty clay loam but in places ranges to heavy silt loam. The solum is 24 to 37 inches thick and is neutral to moderately alkaline. The underlying material ranges from clay loam to silty clay. The quantity of dolomite and shale fragments varies through the profile.

The Ashkum soils are slightly coarser textured than the Montgomery soils, which are underlain by laminated clayey lacustrine sediments. The A and B horizons of the Ashkum soils are silty clay loam; but those horizons in the Montgomery soils are silty clay.

Ashkum silty clay loam, 0 to 3 percent slopes (AtA).—This soil occupies flats, drainageways, and depressions. Included with this soil in mapping are some areas of very poorly drained soils and somewhat poorly drained soils of similar texture.

If properly drained, this soil is slightly limited for crop use. (Capability unit IIw–1; recreation group 6; wildlife group 5; urban trees group 6)

Aztalan Series

The Aztalan series consists of loamy, nearly level and gently sloping, somewhat poorly drained soils that developed from outwash material underlain by lacustrine silt and clay or by clayey glacial till. These soils are on flats and in drainageways and depressions. The native vegetation was prairie grasses.

In a typical profile the surface layer is neutral, black loam about 10 inches thick. It is underlain by a subsurface layer that is about 6 inches thick. This subsurface layer is neutral, very dark grayish-brown gravelly loam containing faint, dark-brown or brown mottles.

The subsoil is about 19 inches thick and is neutral. In the upper part it is dark-brown to brown sandy loam that is mottled with yellowish brown. The middle part of the subsoil is dark-brown to brown loam that contains yellowish-brown and grayish-brown mottles. The lower subsoil is grayish-brown light clay loam that is marked with brown and strong-brown mottles.

The underlying material is calcareous, grayish-brown silty clay loam containing brown to strong-brown mottles.

These soils have high available moisture capacity, slow permeability, and slow internal drainage. They are in good tilth and are readily penetrated by roots to the water table. Seasonally, the water table is less than 3 feet from the soil surface. The fertility in these soils is high.

Typical profile of Aztalan loam, 0 to 2 percent slopes, in a cultivated field (NW¼SE¼ sec. 18, T. 1 N., R. 23 E., Kenosha County):

Ap—0 to 10 inches, black (10YR 2/1) loam; weak, fine, subangular blocky structure that breaks to moderate, medium, granular structure; friable; neutral; abrupt, wavy boundary.

A3—10 to 16 inches, very dark grayish-brown (10YR 3/2) gravelly loam; weak, medium, subangular blocky structure; very friable; common, fine, faint mottles of dark brown or brown (10YR 4/3); neutral; clear, wavy boundary.

B1—16 to 20 inches, dark-brown to brown (10YR 4/3–5/3) sandy loam; weak, medium, subangular blocky structure; very friable; many, fine, distinct mottles of yellowish brown (10YR 5/6–5/8); a few pebbles, as much as 15 millimeters in diameter; neutral; clear, wavy boundary.

B21t—20 to 28 inches, dark-brown or brown (10YR 4/3) loam; moderate, medium, subangular blocky structure; friable; many, fine, distinct mottles of yellowish brown (10YR 5/6–5/8) and grayish brown (10YR 5/2); a few, thin, patchy clay films; neutral; clear, wavy boundary.

IIB22t—28 to 35 inches, grayish-brown (2.5Y 5/2) light clay loam; moderate, medium, subangular blocky structure; slightly plastic when wet; many, medium

distinct mottles of brown (7.5YR 5/4) and strong brown (7.5YR 5/6–5/8); neutral; clear, irregular boundary.

IIC—35 to 48 inches +, grayish-brown (2.5Y 5/2) silty clay loam; massive; slightly plastic when wet; many, medium, distinct mottles of brown (7.5YR 5/4) and strong brown (7.5YR 5/6–5/8); horizon includes thin lenses of silty clay, silt, and very fine sand; calcareous.

The A horizon is loam or sandy loam. The thickness of the solum ranges from 24 to 40 inches. In some areas as much as 6 inches of leached outwash occurs between the solum and the underlying material. In places where the underlying material consists of glacial till, the texture ranges from clay loam to silty clay. Where it consists of lacustrine deposits, the material in some places includes thin layers of fine sand and very fine sand at a depth of 40 inches or more.

The Aztalan soils are more loamy in the A horizon and the upper part of the B horizon than the Martinton soils.

Aztalan loam, 0 to 2 percent slopes (AzA).—This soil has the profile described as typical for the series. It occurs on flats, along drainageways, and in depressions. In some places the drainageways extend into areas of Hebron and Symerton soils in an irregular pattern. Runoff is very slow.

Included with this soil in mapping are small areas where the surface layer is silt loam, as well as small areas in which this layer is lighter colored than the typical one. Also included are small areas of Martinton silt loam, Mundelein silt loam, and Kane silt loam, clayey substratum.

If this Aztalan soil is properly drained, it has only slight limitations that affect its use for crops. (Capability unit IIw-2; recreation group 5; wildlife group 4; urban trees group 6)

Aztalan loam, 2 to 6 percent slopes (AzB).—This soil occupies flats, drainageways, and side slopes where seepage occurs. In some places the drainageways extend into areas of Hebron and Symerton soils in an irregular pattern. This soil has a profile somewhat similar to that described as typical for the series, but it shows less mottling and has a thinner surface layer and subsoil. Runoff is slow, and the erosion hazard is slight.

Included in mapping are small areas where the surface layer is either silt loam or is lighter colored than the one described as typical. Also included are small areas of Martinton silt loam, Mundelein silt loam, and Kane silt loam, clayey substratum.

For producing crops on this soil, the limitations are only slight if drainage is adequate. The hazard of erosion is slight. (Capability unit IIw-2; recreation group 5; wildlife group 4; urban trees group 6)

Aztalan sandy loam, 1 to 3 percent slopes (AuA).—This soil occupies flats, drainageways, and depressions. In some places the drainageways extend into areas of Hebron and Symerton soils in an irregular pattern. Runoff is slow, and the erosion hazard is slight.

Included with this soil in mapping are small areas in which the surface layer is lighter colored than normal, a few places where slopes range from 4 to 6 percent, and small areas of Wasepi sandy loam, clayey substratum.

If this Aztalan soil is properly drained, its use for crops is only slightly limited. Where slopes are gentle, erosion is a slight hazard. (Capability unit IIIw–5; recreation group 5; wildlife group 4; urban trees group 6)

Beecher Series

The Beecher series consists of somewhat poorly drained soils that developed in a thin silt mantle and in the underlying clay loam to silty clay loam glacial till. These nearly level to gently sloping soils are along drainageways, in depressions, and on foot slopes. The native vegetation was prairie grasses and sparse hardwoods.

In a typical profile the surface layer is neutral, very dark brown silt loam about 9 inches thick. The subsurface layer, about 3 inches thick, is neutral, dark grayish-brown silt loam containing a few yellowish-brown mottles.

The subsoil is about 16 inches thick. In the upper part it is slightly acid to neutral, grayish-brown silty clay loam that has yellowish-brown mottles. The middle part of the subsoil is slightly acid to neutral, grayish-brown silty clay mottled with gray and yellowish brown. The lower subsoil is neutral, dark grayish-brown silty clay mottled with gray and yellowish brown.

The underlying material is calcareous, grayish-brown silty clay loam mottled with yellowish brown and gray to light gray. Dolomite pebbles and shale chips are present.

The Beecher soils have high available moisture capacity, slow surface runoff, moderately slow permeability, and slow internal drainage. Their fertility is high, and tilth is good. Roots penetrate to the water table, which, seasonally, is 1 foot to 3 feet below the soil surface.

Typical profile of Beecher silt loam, 1 to 3 percent slopes, in a cultivated field (NE¼NE¼ sec. 36, T. 1 N., R. 21 E., Kenosha County):

Ap—0 to 9 inches, very dark brown (10YR 2/2) silt loam; weak, moderate, subangular blocky structure that breaks to moderate, medium, granular structure; very friable; streaks of A2 horizon caused by tillage; neutral; abrupt, wavy boundary.

A2—9 to 12 inches, dark grayish-brown (10YR 4/2) silt loam; very weak, medium, platy structure that breaks to weak to moderate, fine subangular blocky structure; friable; few, fine, faint mottles of yellowish brown (10YR 5/4); neutral; clear, irregular boundary.

B1t—12 to 15 inches, grayish-brown (10YR 5/2) silty clay loam; moderate, fine, subangular blocky structure; firm; common, fine, distinct mottles of yellowish brown (10YR 5/6); slightly acid to neutral; clear, irregular boundary.

IIB2t—15 to 22 inches, grayish-brown (10YR 5/2) silty clay; moderate, medium, subangular blocky structure that breaks to moderate to strong, fine, angular blocky structure; very firm; some weathered dolomitic fragments; common, medium, distinct mottles of gray (10YR 5/1) and yellowish brown (10YR 5/4–5/6); few, very dark brown (10YR 2/2) organic stains on ped faces; conspicuous, complete clay films; slightly acid to neutral; clear, irregular boundary.

IIB3t—22 to 28 inches, dark grayish-brown (10YR 4/2) silty clay; moderate to strong, medium, angular blocky structure; very firm; many, medium, distinct mottles of gray (10YR 5/1) and yellowish brown (10YR 5/4–5/6); some coating of very dark brown (10YR 2/2) organic matter on ped faces; clay films; few weathered dolomitic fragments; neutral; clear, irregular boundary.

IIC—28 to 48 inches +, grayish-brown (2.5Y 5/2) silty clay loam; weak, medium, subangular blocky structure that becomes massive with depth; firm; many,

coarse, distinct mottles of yellowish brown (10YR 5/6) and gray to light gray (5Y 6/1); abundant dolomitic fragments; highly calcareous.

The thickness of the surface layer ranges from 6 to 9 inches in undisturbed areas. The color of this layer ranges from black (10YR 2/1) to very dark grayish brown (10YR 3/2). The silt mantle is 10 to 20 inches thick, and the solum is 24 to 36 inches thick. Reaction of the solum is neutral to slightly acid. Generally, the underlying material is clay loam or silty clay loam, but in places it ranges to heavy silt loam or silty clay.

The Ap layer of the Beecher soils is very dark brown and about 9 inches thick. In contrast, the Ap layer of the Morley soils is dark grayish brown and about 8 inches thick.

Beecher silt loam, 1 to 3 percent slopes (BcA).—This soil occurs in depressions and along drainageways, in most places between soils of the Morley or Markham series and soils of the Ashkum series. Many areas occupy drainageways that extend into areas of Morley and Markham soils in an irregular pattern.

Included with this soil in mapping are small areas of Aztalan loam, Blount silt loam, Elliott silty clay loam, and Ashkum silty clay loam.

If properly drained, this soil has only slight limitations for crop use. The erosion hazard is slight. The surface drainage pattern of the soil lends itself to the construction of waterways. (Capability unit IIw–2; recreation group 5; wildlife group 2; urban trees group 6)

Blount Series

The Blount series is made up of somewhat poorly drained soils that developed from a thin silt mantle and the underlying clay loam to silty clay loam glacial till. These nearly level to gently sloping soils occupy drainageways, depressions, and foot slopes. The native vegetation was hardwoods.

In a typical profile the surface layer is neutral, black to very dark brown silt loam about 5 inches thick. The subsurface layer, about 3 inches thick, is medium to strongly acid, grayish-brown silt loam.

The subsoil is about 20 inches thick. The upper part is slightly acid, dark grayish-brown silty clay loam mottled with yellowish brown. The middle part is slightly acid to neutral, dark-brown to brown silty clay that contains gray and yellowish-brown mottles. The lower subsoil is calcareous, dark-brown to brown silty clay mottled with gray and yellowish brown.

The underlying material is calcareous, dark-gray to dark grayish-brown silty clay to silty clay loam mottled with yellowish brown. Dolomite pebbles and shale chips are present.

These soils have high available moisture capacity, slow surface runoff, moderately slow permeability, and slow internal drainage. Their fertility is moderate, and tilth is good. Roots penetrate to the water table. Seasonally, the water table is 1 foot to 3 feet below the soil surface.

Typical profile of Blount silt loam, 1 to 3 percent slopes, in an undisturbed area (NE¼NW¼ sec. 30, T. 3 N., R. 21 E., Racine County):

A1—0 to 5 inches, black to very dark brown (10YR 2/1–2/2) silt loam; moderate, medium, granular structure; very friable; neutral; abrupt, wavy boundary.

A2—5 to 8 inches, grayish-brown (10YR 5/2) silt loam; moderate, medium, platy structure; friable; medium to strongly acid; clear, wavy boundary.

B1t—8 to 11 inches, dark grayish-brown (10YR 4/2) silty clay loam; moderate, fine, subangular blocky structure; firm; few, fine, distinct mottles of yellowish brown (10YR 5/4); slightly acid; clear, irregular boundary.

B21t—11 to 17 inches, dark-brown to brown (10YR 4/3) silty clay; moderate, fine, subangular blocky structure; very firm; few to common, fine, distinct mottles of gray (10YR 5/1) and yellowish brown (10YR 5/4–5/6); a few pebbles; complete clay films; slightly acid; gradual, irregular boundary.

B22t—17 to 24 inches, dark-brown to brown (10YR 4/3) silty clay; moderate to strong, medium, subangular blocky structure; very firm; common, fine, distinct mottles of gray (10YR 5/1) and yellowish brown (10YR 5/4–5/6); some very dark grayish-brown (10YR 3/2) organic stains on ped faces; complete clay films; some dolomite pebbles; slightly acid to neutral; clear, irregular boundary.

B3t—24 to 28 inches, dark-brown to brown (10YR 4/3) silty clay; weak to moderate, medium, subangular blocky structure; very firm; many, medium, distinct mottles of gray (10YR 5/1) and yellowish brown (10YR 5/4–5/6); some very dark grayish-brown (10YR 3/2) organic stains on ped faces; partial clay films; numerous weathered dolomitic fragments, most of them less than 15 millimeters in diameter; calcareous; clear, irregular boundary.

C—28 to 48 inches +, dark-gray (10YR 4/1) to dark grayish-brown (2.5Y 4/2) silty clay to silty clay loam; weak, medium, subangular blocky structure becoming massive with depth; very firm; mottles of yellowish brown (10YR 5/4–5/6) comprise 30 to 40 percent of the mass; numerous dolomitic fragments; streaks of light-gray (10YR 7/1), soft, segregated lime; very highly calcareous.

In cultivated areas the layer ranges from 6 to 9 inches in thickness and is mainly dark grayish brown (10YR 4/2) in color. The solum ranges from 24 to 36 inches in thickness, and the silt mantle is 10 to 20 inches thick. The texture of the underlying material is clay loam to silty clay.

The Blount soils have a black to very dark-brown surface layer that is about 5 inches thick. The surface layer of the Elliott soils is darker colored and about 10 inches in thickness.

Blount silt loam, 1 to 3 percent slopes (BlA).—This soil lies in depressions and along drainageways, generally between the Morley and Ashkum soils. In many areas the drainageways extend into areas of Morley soils in an irregular pattern. Included with this soil in mapping are small areas of Aztalan loam, Beecher silt loam, and Ashkum silty clay loam on similar slopes.

If properly drained, this soil has only slight limitations that affect its use for crops. The erosion hazard is slight. The surface drainage pattern of this soil lends itself to the construction of waterways. (Capability unit IIw–2; recreation group 5; wildlife group 2; urban trees group 6)

Boyer Series

In the Boyer series are well-drained soils that are underlain by stratified sandy outwash. These gently sloping to moderately steep soils occupy ridges and knobs. The native vegetation was hardwoods.

In a typical profile the surface layer is neutral, dark-brown to brown sandy loam about 6 inches thick. The subsurface layer, about 7 inches thick, is neutral, yellowish-brown loamy sand.

The subsoil is about 16 inches thick and is neutral. The upper part of the subsoil is reddish-brown loam.

The middle part is reddish-brown sandy loam. The lower subsoil is reddish-brown loamy sand.

The underlying material is calcareous, yellowish-brown medium sand.

These soils have medium available moisture capacity, moderately rapid permeability, and rapid internal drainage. Their fertility is low. The tilth in these soils is good, and roots penetrate to a depth of 5 feet or more.

Typical profile of Boyer sandy loam, 2 to 6 percent slopes, in a cultivated area (NE¼SE¼ sec. 28, T. 4 N., R. 23 E., Racine County):

Ap—0 to 6 inches, dark-brown to brown (10YR 4/3) sandy loam; weak, medium, granular structure; friable; neutral; abrupt, wavy boundary.

A2—6 to 13 inches, yellowish-brown (10YR 5/4) loamy sand; weak, fine, granular structure; very friable; neutral; abrupt, irregular boundary.

B21t—13 to 17 inches, reddish-brown (5YR 4/4) loam; weak, medium, subangular blocky structure; friable; dark-brown to brown (7.5YR 5/4) stains; patchy clay films on peds; neutral; clear, irregular boundary.

B22t—17 to 26 inches, reddish-brown (5YR 4/4) sandy loam; weak, medium, subangular blocky structure; friable; neutral; gradual, irregular boundary.

B3 —26 to 29 inches, reddish-brown (5YR 4/4) loamy sand; weak, medium, subangular blocky structure; friable; neutral; clear, irregular boundary.

C—29 to 60 inches, yellowish-brown (10YR 5/4) medium sand; single grain; loose; calcareous.

The texture of the surface soil is sandy loam, loamy fine sand, or loamy sand. The texture of the subsoil ranges from loamy sand to sandy clay loam. The sandy clay loam is generally less than 10 inches thick. Depth to the underlying material ranges from 24 to 36 inches. The texture of the C horizon varies from fine sand to coarse sand.

The Boyer soils have a coarser textured surface layer and subsoil than the Fox and Casco soils.

Boyer loamy sand, 1 to 6 percent slopes (BmB).—This soil is on low ridges and knobs. The surface layer is coarser textured than the one described as typical for the series. Runoff is slow, and the erosion hazard is slight.

Included with this soil in mapping are areas in which the subsoil is a series of bands, each less than 2 inches thick. Banding generally is at a depth of 30 inches or more. Some of these banded soils have a fine sand surface layer that is subject to soil blowing. These fine sand inclusions have a lower available moisture capacity than Boyer loamy sand, 1 to 6 percent slopes. Also included are some small areas that have a dark surface soil, a clayey substratum, or a sandy profile that lacks the typical loam to sandy loam subsoil.

The use of this soil for crops is moderately limited by low fertility and medium available moisture capacity. (Capability unit IVs–3; recreation group 4; wildlife group 7; urban trees group 4)

Boyer loamy sand, 6 to 12 percent slopes, eroded (BmC2).—This slightly to moderately eroded soil occupies ridges and knobs. It has a coarser textured, lighter colored, and thinner surface layer than that described as typical for the series. As much as two-thirds of the original surface layer has been removed through erosion. Runoff is medium, and the erosion hazard is moderate.

Included with this soil in mapping are areas in which the subsoil is a series of bands, each less than 2 inches thick. Banding generally occurs at a depth of 30 inches or more. Some of these banded soils have a fine sand surface layer that is subject to blowing. These fine sand inclusions have a lower available moisture capacity than is typical for the mapping unit. Also included is a small acreage of active sand dunes and soils having a sandy profile that lacks the typical loam to sandy loam subsoil. In addition, there are small inclusions where the slope is greater than 12 percent.

Low fertility and medium available moisture capacity are moderate limitations that affect the use of this soil for crops. (Capability unit IVe–4; recreation group 4; wildlife group 7; urban trees group 4)

Boyer sandy loam, 2 to 6 percent slopes (BnB).—This soil is on low ridges and knobs. It has the profile described as typical for the series. Runoff is slow, and the erosion hazard is slight.

A few, small, moderately eroded areas are included with this soil in mapping. These eroded areas have a lighter colored surface layer because tillage has mixed some of the upper subsoil with the surface layer.

The use of this soil for crops is moderately limited by low fertility and medium available moisture capacity. (Capability unit IIIe–4; recreation group 2; wildlife group 7; urban trees group 3)

Casco Series

The Casco series is made up of well-drained, loamy soils that are underlain by outwash sand and gravel. These soils are gently sloping on terraces and are sloping to moderately steep on morainic ridges. They generally are near the major streams in the survey area. The native vegetation was hardwood.

In a typical profile the surface layer is neutral, dark-brown to brown loam about 6 inches thick. The subsoil is about 12 inches thick and, in the upper part, consists of neutral, dark-brown to brown clay loam. The lower part is mildly alkaline, dark-brown to brown sandy clay loam that contains many pebbles. The underlying material is calcareous, stratified, reddish-yellow sand and pinkish-gray gravel.

These soils have rapid internal drainage and moderate permeability. Generally, their available moisture capacity is medium, and crop growth is quickly retarded in dry periods. The soils are low in fertility and are neutral or mildly alkaline. Roots easily penetrate to the underlying sand and gravel.

Typical profile of Casco loam, 6 to 12 percent slopes, eroded, in a cultivated area (SW¼NW¼ sec. 26, T. 3 N., R. 19 E., Racine County):

Ap—0 to 6 inches, dark-brown to brown (10YR 4/3) loam; weak, fine, granular structure; very friable when moist; neutral; clear, smooth boundary.

B1—6 to 10 inches, dark-brown to brown (7.5YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm; patchy clay films; plentiful plant roots; some pebbles, most of them less than 10 millimeters in diameter; neutral; clear, irregular boundary.

B2t—10 to 15 inches, strong-brown (7.5YR 4/6–5/6) clay loam; moderate to strong, medium, subangular blocky structure; firm; continuous clay films; some pebbles, most of them less than 20 millimeters in diameter; plentiful plant roots; neutral; clear, irregular boundary.

B3t—15 to 18 inches, dark-brown to brown (7.5YR 4/4) sandy clay loam; moderate, fine, subangular blocky structure; friable; abundant pebbles and dolomitic fragments; mildly alkaline; clear, irregular boundary.

C—18 to 48 inches +, stratified, reddish-yellow (7.5YR 7/6) sand and pinkish-gray (7.5YR 7/2) gravel; single grain; loose when moist; some cobblestones as much as 5 inches in diameter; very highly calcareous.

The solum ranges from 12 to 20 inches in thickness but generally is 16 to 20 inches thick. It developed mostly or entirely from outwash sand and gravel. The A horizon ranges from silt loam to sandy loam in texture. In cultivated fields the Ap horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3) to grayish brown (10YR 5/2), depending on the degree of erosion. In undisturbed areas there is a very dark grayish-brown (10YR 3/2) A1 horizon 4 to 6 inches thick and a dark-brown to brown (10YR 4/3–5/3) A2 horizon 2 to 4 inches thick. Where the solum is less than 16 inches thick, the B1 horizon is absent or very thin. In places the C horizon consists mainly of either sand or gravel.

The Casco soils are only 12 to 20 inches deep over sand and gravel, whereas the Fox soils are more than 20 inches deep over the same kinds of material.

Casco loam, 2 to 6 percent slopes (CeB).—This soil is underlain by sand and gravel at a depth of 18 to 20 inches. Little or no erosion has occurred. This soil differs from that described as typical for the series because its surface layer and subsoil are slightly thicker and its surface layer is slightly darker. Runoff is slow, and the erosion hazard is slight. Small areas of Fox soils and other Casco soils are included with this soil in mapping.

Low fertility and medium available moisture capacity are moderate limitations that affect the use of this soil for crops. (Capability unit IIIe–4; recreation group 2; wildlife group 6; urban trees group 5)

Casco loam, 2 to 6 percent slopes, eroded (CeB2).—This soil lies on terraces and is slightly or moderately eroded. It generally occurs with Fox soils and other Casco soils on terraces, and it adjoins Fabius and Mussey soils, which occupy drainageways and lower slopes. The surface layer and subsoil of this soil are thicker than the ones described as typical for the Casco series. As much as two-thirds of the original surface layer has been removed through erosion.

Included in areas mapped as this soil are small areas of Fox loam, of slightly or moderately eroded Casco silt loam, and of severely eroded Casco loam.

The use of this soil for crops is moderately limited by low fertility, medium available moisture capacity, and slope. (Capability unit IIIe–4; recreation group 2; wildlife group 6; urban trees group 5)

Casco loam, 6 to 12 percent slopes, eroded (CeC2).—This soil lies on terraces and is slightly to moderately eroded. It generally occurs with Fox soils and other Casco soils. It has the profile described as typical for the series. As much as two-thirds of the original surface layer has been lost through erosion. Runoff is medium and causes a moderate hazard of erosion.

Included with this soil in mapping are areas of Fox loam; slightly eroded or severely eroded Casco loam; and moderately eroded Casco silt loam. Also included are a few areas in which the surface layer is darker than typical.

The use of this soil for crops is moderately limited by low fertility, medium available moisture capacity, and slope. (Capability unit IVe–4; recreation group 2; wildlife group 6; urban trees group 5)

Casco loam, 12 to 20 percent slopes, eroded (CeD2).—This soil generally occurs with Fox loam and Rodman gravelly loam. It occupies morainic ridges and is slightly to moderately eroded. The surface layer and subsoil are thinner than those described as typical for the series. Also, the available moisture capacity is lower than described for the Casco series. As much as two-thirds of the surface layer has been removed through erosion. Runoff is rapid, and the erosion hazard is severe.

Included with this soil in mapping are areas of moderately eroded Fox loam, slightly eroded Casco loam, and slightly eroded Rodman gravelly loam. Also included are some small areas that have a silt loam surface layer or a darker surface layer.

The strong slope, medium available moisture capacity, and low fertility severely limit this soil for crop use. (Capability unit VIe–4; recreation group 2; wildlife group 6; urban trees group 5)

Casco sandy loam, 2 to 6 percent slopes (CcB).—This soil lies on terraces. It commonly occurs with Fox soils and other Casco soils. Its profile differs from that described as typical for the series because the surface layer is thicker, darker, and coarser textured and the combined thickness of the surface layer and subsoil is greater. Surface runoff is less than on Casco loam, 6 to 12 percent slopes, eroded. The hazard of erosion is slight. Included with this soil in mapping are small areas of Fox sandy loam and moderately eroded Casco sandy loam.

The medium available moisture capacity and low fertility moderately limit this soil for crop use. (Capability unit IIIe–4; recreation group 2; wildlife group 6; urban trees group 5)

Casco sandy loam, 6 to 12 percent slopes, eroded (CcC2).—This eroded soil occupies terraces. It generally occurs with Fox soils and other Casco soils. The surface layer is coarser textured than that described as typical for the series. As much as two-thirds of the original surface layer has been removed through erosion. Runoff is medium, and the erosion hazard is moderate. Included with this soil in mapping are small areas of slightly eroded or severely eroded Casco sandy loam.

For crop use, this soil is moderately limited by slope, medium available moisture capacity, and low fertility. (Capability unit IVe–4; recreation group 2; wildlife group 6; urban trees group 5)

Casco-Miami loams, 6 to 12 percent slopes (CoC).—This complex is on morainic hills and ridges in the western part of the survey area. It consists of sloping, well-drained soils that are so intermingled that they were not mapped separately. From 35 to 50 percent of the complex is Casco loam, 20 to 35 percent is Miami loam, and the rest is Fox, Hochheim, and Sisson soils. The Casco and Fox soils generally occupy the steeper side slopes.

The Casco soil in this complex is thicker in the surface layer and the subsoil than the soil described as typical for the series. The Miami soil generally has a thinner surface layer and subsoil than the soil described as typical for the Miami series.

Both soils have limitations that affect their use for crops. Low fertility, medium available moisture capacity, and slope are the main features that restrict use of the Casco soil. For the Miami soil the main limitation is slope. Medium runoff causes a moderate hazard of erosion. (Capability unit IVe–4; recreation group 2; wildlife group 6; urban trees group 5)

Casco-Miami loams, 12 to 20 percent slopes (CoD).—This complex is on morainic hills and ridges in the western part of the survey area. It consists of moderately steep, well-drained soils that are so intermingled that they were not mapped separately. From 40 to 55 percent of the complex is Casco soils, 15 to 30 percent is Miami soils, and the rest is Fox, Hochheim, and Sisson soils. The Casco and Fox soils generally occupy the steeper side slopes.

Both the Casco and Miami soils in this complex have a thinner surface layer and subsoil, and are subject to greater surface runoff, than the soils described as typical for their series. Erosion is a severe hazard.

This complex is severely limited for crop use because of the strong slopes and because of the medium available moisture capacity and low fertility of the Casco soil. (Capability unit VIe–4; recreation group 2; wildlife group 6; urban trees group 5)

Casco-Rodman complex, 6 to 12 percent slopes (CrC.)—This complex consists of sloping, well-drained and excessively drained soils in the western part of the survey area. The soils occupy morainic ridges and kettle holes and are so intermingled that they were not mapped separately. About 50 percent of the complex is Casco soil, about 30 percent is Rodman soil, and the rest is Fox, Miami, and Sisson soils. The Rodman soil is on the steeper, upper side slopes; the Casco occupies the ridge crests and lower slopes.

The profile of the Casco soil in this complex is less eroded than that described as typical for the series. Thus, the surface layer, as well as the subsoil, is thicker. In some places, the profile of the Rodman soil contains 2 to 5 inches of gravelly clay loam in the subsoil and has a thicker subsoil than that described as typical for the series. In this complex the Rodman soil has slightly higher available moisture capacity than is typical.

The Rodman soil in this complex is severely limited for crop use because of slope, low fertility, and low available moisture capacity. The use of the Casco soil for crops is moderately limited. Both soils are moderately susceptible to erosion. (Capability unit IVe–4; recreation group 2; wildlife group 6; urban trees group 5)

Casco-Rodman complex, 12 to 20 percent slopes, eroded (CrD2).—This complex occupies morainic ridges and kettle holes in the western part of the survey area. It consists of moderately steep, well-drained and excessively drained soils that occur in such a mixed pattern that they were not mapped separately. As much as two-thirds of the surface layer has been removed through erosion. Casco soils make up about 45 percent of the complex, Rodman soils about 35 percent, and Fox, Miami, and Sisson soils the rest. Rodman soils occupy the steeper, upper side slopes; Casco soils are on the ridge crests and lower slopes.

The Casco soil in this complex has greater surface runoff than Casco soils having milder slopes. The Rodman soil in this complex, in places, has 2 to 4 inches of gravelly clay loam in its subsoil and therefore has a thicker subsoil than that described as typical for the Rodman series. The Rodman soil also has a somewhat higher moisture-holding capacity than the soil described in the typical profile.

Strong slopes, a severe hazard of erosion, and low fertility severely limit both soils for crop use. In addition, the low available moisture capacity of the Rodman soil is restrictive. (Capability unit VIe–4; recreation group 2; wildlife group 6; urban trees group 5)

Casco-Rodman complex, 20 to 35 percent slopes (CrE).—This complex occupies morainic ridges and kettle holes in the western part of the survey area. It consists of steep, well-drained and excessively drained soils that are so intermingled that they were not mapped separately. Casco soils comprise about 40 percent of the complex, Rodman soils about 40 percent, and Fox and Miami soils the rest. Rodman soils occupy the steeper, upper slopes; the Casco soils are on ridge crests and lower slopes.

The Casco soil of this complex has a thinner surface layer and subsoil and lower available moisture capacity than are typical for the Casco series. The Rodman soil of the complex is similar to that described as typical for the Rodman series.

The use of these soils for crops is very severely limited by the strong slopes of both soils and by the low fertility and low available moisture capacity of the Rodman soil. The erosion hazard is very severe. (Capability unit VIIs–5; recreation group 2; wildlife group 6; urban trees group 5)

Clayey land (Cv) consists of filled and leveled areas where fill is mainly underlying material from the clayey soils of the survey area. This land type includes borrow pits, many of which are along Interstate Highway 94. In these pits, several feet of soil material has been removed for use in highway construction and, in most places, replaced by as much as 6 inches of topsoil. A considerable acreage of the abandoned Bong Air Force Base has been cut, filled, leveled, and covered with 4 to 5 inches of topsoil.

Because much of Clayey land has been compacted by heavy machinery, runoff is excessive. This land is not well suited to plant growth. (Capability unit VIIIs–10; recreation group 9; wildlife group 10; urban trees group 10)

Colwood Series

The Colwood series consists of loamy, poorly drained soils that developed from laminated lacustrine silt, very fine sand, and fine sand. These soils occur on flats, in depressions, and along drainageways. The Colwood soils in this survey area contain a higher percentage of silt than is normal for the central concept of the series. The native vegetation was water-tolerant grass and shrubs.

In a typical profile the surface layer is black silt loam about 10 inches thick. The subsurface layer is dark grayish-brown light silty clay loam. It is about 4 inches thick and has a few light olive-brown mottles.

The subsoil is about 26 inches thick. The upper part is olive-gray to gray silty clay loam that contains a few mottles of yellowish brown. The middle part of the sub-

soil is mildly alkaline, gray gritty silty clay loam that has a few mottles of yellowish brown. The lower subsoil is calcareous, light brownish-gray silty clay loam containing many mottles of strong brown.

The underlying material is calcareous, pale-brown and light brownish-gray, stratified silt and very fine sand with many mottles of strong brown.

These soils have high available moisture capacity, moderate permeability, and very slow internal drainage. The tilth in these soils is good, and their fertility is moderate. Roots penetrate to the water table, which, seasonally is less than 1 foot below the soil surface.

Typical profile of Colwood silt loam in a cultivated field (NW¼NE¼ sec. 30, T. 1 N., R. 23 E., Kenosha County):

Ap—0 to 10 inches, black (10YR 2/1) silt loam; weak to moderate, medium, subangular blocky structure that breaks to moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A3g—10 to 14 inches, dark grayish-brown (2.5Y 4/2) light silty clay loam; moderate, medium, subangular blocky structure; slightly hard when dry, slightly plastic when wet; few, fine, distinct mottles of light olive brown (2.5Y 5/6); neutral; clear, smooth boundary.

B21g—14 to 24 inches, olive-gray (5Y 5/2) to gray (5Y 5/1) silty clay loam; moderate to strong, fine, subangular blocky structure; slightly hard when dry, slightly plastic when wet; few, medium, distinct mottles of yellowish brown (10YR 5/6–5/8); patchy clay films on ped faces; neutral; clear, smooth boundary.

B22g—24 to 31 inches, gray (5Y 5/1) gritty silty clay loam; moderate, fine, subangular blocky structure; slightly hard when dry, slightly plastic when wet; few, medium, distinct mottles of yellowish brown (10YR 5/6–5/8); patchy clay films on ped faces; mildly alkaline; clear, smooth boundary.

B3g—31 to 40 inches, light brownish-gray (2.5Y 6/2) silty clay loam; weak to moderate, fine, subangular blocky structure; slightly hard when dry, slightly plastic when wet; many, medium, distinct mottles of strong brown (7.5YR 5/6–5/8); calcareous; clear, smooth boundary.

C—40 to 60 inches, pale-brown (10YR 6/3) and light brownish-gray (2.5Y 6/2), laminated silt and very fine sand; very friable; many, medium, distinct mottles of strong brown (7.5YR 5/6–5/8); highly calcareous.

The surface layer is dominantly silt loam, but in a few places it ranges to fine sandy loam. The texture of the subsoil ranges from loam to silty clay. Depth to the underlying material is 24 to 42 inches. The underlying material consists mainly of laminated silt, very fine sand, and fine sand, but in some areas includes layers of loamy and clayey material at depths of 40 inches or more.

The Colwood soils have poor drainage like the Montgomery and Granby soils, but they differ from those soils in kind of material in which they formed. Colwood soils formed in silt to fine sand, but the Montgomery soils formed in clay, and the Granby soils in deep, loose sand.

Colwood silt loam (0 to 2 percent slopes) (Cw).—This soil occupies flats, drainageways, and small depressions. Included with it in mapping are areas that have a fine sandy loam surface layer. Also included are areas where layers of sand and gravel are in the underlying material at a depth of 40 inches or more.

If this soil is drained, its use for crops is only slightly limited. Surface runoff is ponded to very slow. (Capability unit IIIw-3; recreation group 6; wildlife group 5; urban trees group 6)

Conover Series

The Conover series consists of somewhat poorly drained soils that developed in a silt mantle over loamy glacial till. These nearly level to gently sloping soils occupy drainageways, foot slopes, and depressions. The native vegetation was prairie grasses and sparse hardwoods.

In a typical profile the surface layer is neutral, very dark gray silt loam about 7 inches thick. The subsurface layer, about 5 inches thick, is neutral, brown gritty silt loam that has a few mottles of grayish brown, yellowish brown, and light gray.

The subsoil is about 19 inches thick. The upper part is neutral, dark-brown to brown loam that has a few mottles of grayish brown, yellowish brown, and gray to light gray. The middle part of the subsoil is neutral, dark yellowish-brown light clay loam. It has a few mottles of yellowish brown, gray, and brownish gray. The lower subsoil is yellowish-brown loam that contains many mottles.

The underlying material is calcareous, yellowish-brown to light yellowish-brown light loam to fine sandy loam. It contains many mottles of grayish brown, yellowish brown, and strong brown.

These soils have moderately high available moisture capacity, moderately slow permeability, and slow internal drainage. Their tilth is good, and their fertility is moderate. Roots penetrate to the water table. Seasonally, the water table is less than 1 foot below the soil surface.

Typical profile of Conover silt loam, 1 to 3 percent slopes, in a cultivated field (NE¼SW¼ sec. 27, T. 1 N., R. 19 E., Kenosha County):

Ap—0 to 7 inches, very dark gray (10YR 3/1) silt loam; weak, medium, subangular blocky structure that breaks to moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A2—7 to 12 inches, brown (10YR 5/3), gritty silt loam; moderate, medium, platy structure; friable; few, medium, distinct mottles of grayish brown (10YR 5/2), yellowish brown (10YR 5/6), and gray to light gray (10YR 6/1); neutral; clear, wavy boundary.

B1—12 to 15 inches, dark-brown to brown (10YR 4/3) loam; weak, coarse, platy structure; friable; few, medium, distinct mottles of grayish brown (10YR 5/2), yellowish brown (10YR 5/6), and gray to light gray (10YR 6/1); neutral; gradual, wavy boundary.

B2t—15 to 21 inches, dark yellowish-brown (10YR 4/4) light clay loam; moderate, medium, prismatic structure that breaks to moderate, medium, subangular blocky structure; slightly hard when dry, slightly plastic when wet; few, medium, distinct mottles of grayish brown (10YR 5/2), yellowish brown (10YR 5/6), and gray to light gray (10YR 6/1); neutral; conspicuous clay films on peds; gradual, wavy boundary.

B3—21 to 31 inches, yellowish-brown (10YR 5/4) loam; weak, coarse, prismatic structure that breaks to weak, moderate, subangular blocky structure; friable; many, medium, distinct mottles of yellowish brown (10YR 5/6), gray to light gray (10YR 6/1), and light brownish gray (10YR 6/2); mildly alkaline; gradual, irregular boundary.

C—31 to 60 inches, yellowish-brown (10YR 5/4) to light yellowish-brown (10YR 6/4) light loam to fine sandy loam; weak, moderate, subangular blocky structure; friable; many, medium, distinct mottles of grayish brown (10YR 5/2), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/6); highly calcareous.

The silt mantle ranges from 0 to 18 inches in thickness. Most of the subsoil developed in glacial till. The solum generally ranges from 24 to 36 inches in thickness, but in places it is as much as 42 inches thick. The texture of the underlying material varies from loam to heavy sandy loam.

The subsoil of the Conover soils has distinct mottling, which is lacking in the subsoil of the Miami and McHenry soils.

Conover silt loam, 1 to 3 percent slopes (CyA).—This soil occupies drainageways, foot slopes, and depressions. Surface runoff is slow, and the erosion hazard is slight. Included with this soil in mapping are small areas of Pella silt loam. Also included are some areas of Conover soils having slopes of 4 and 5 percent.

If properly drained, this soil is slightly limited for crop use. (Capability unit IIw-2; recreation group 5; wildlife group 2; urban trees group 6)

Darroch Series, Neutral Variant

The Darroch series, neutral variant, consists of loamy, somewhat poorly drained soils that developed from laminated lacustrine silt, very fine sand, and fine sand. These nearly level to gently sloping soils occur on flats, along drainageways, and in depressions. The native vegetation was prairie grasses.

In a typical profile the surface layer is neutral, very dark gray fine sandy loam about 9 inches thick.

The subsoil is about 15 inches thick. The upper part is neutral, yellowish-brown fine sandy loam that has a few mottles of dark gray to gray. The middle part is neutral, brownish-yellow heavy loam that contains common mottles of dark gray and gray. The lower subsoil is mildly alkaline, yellowish-brown very fine sandy loam that has many mottles of gray and light gray.

The underlying material is calcareous, yellowish-brown, laminated silt, very fine sand, and fine sand marked with common gray mottles.

These soils have high available moisture capacity, moderate permeability, and slow internal drainage. The tilth in these soils is good, and their fertility is moderate. Roots penetrate to the water table, which, seasonally, is less than 3 feet below the soil surface.

Typical profile of Darroch fine sandy loam, neutral variant, 0 to 3 percent slopes, in a cultivated area (NW¼SW¼ sec. 18, T. 1 N., R. 22 E., Kenosha County):

Ap—0 to 9 inches, very dark gray (10YR 3/1) fine sandy loam; weak, fine, granular structure; very friable; neutral; abrupt, smooth boundary.

B1—9 to 14 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, fine, subangular blocky structure; friable; few, medium, distinct mottles of dark gray (10YR 4/1) and gray (10YR 5/1); neutral; clear, smooth boundary.

B2t—14 to 21 inches, brownish-yellow (10YR 6/6) heavy loam; weak, medium, subangular blocky structure; friable; common, medium, distinct mottles of dark gray (10YR 4/1) and gray (10YR 5/1); patchy clay films on peds; neutral; clear, smooth boundary.

B3—21 to 24 inches, yellowish-brown (10YR 5/6) very fine sandy loam; weak, fine, subangular blocky structure; friable; many, medium, distinct mottles of gray (10YR 5/1–6/1); mildly alkaline; clear, smooth boundary.

C1—24 to 30 inches, yellowish-brown (10YR 5/6) silt; massive; friable; common, medium, distinct mottles of gray (10YR 5/6–6/1); calcareous; clear, smooth boundary.

C2—30 to 60 inches, yellowish-brown (10YR 5/4) laminated silt, very fine sand, and fine sand; massive or single grain; common, medium, distinct mottles of gray (10YR 5/1–6/1); friable; calcareous.

The texture of the surface layer is dominantly fine sandy loam, but in places it is loam. Thickness of the surface layer ranges from 7 to 12 inches. The texture of the subsoil ranges from sandy loam to clay loam. Depth to the underlying material is 24 to 30 inches. The underlying material is mainly laminated silt, very fine sand, and fine sand, but in some areas it includes layers of loamy and clayey material below a depth of 40 inches.

The Darroch soils, like the Yahara and Mundelein soils, are somewhat poorly drained. The Ap layer is very dark gray in the Darroch soils, as compared to very dark grayish brown in the Yahara soils. The subsoil of the Darroch soils is loam, but the subsoil of the Yahara soils is fine sandy loam to loamy fine sand, and that of the Mundelein soils is silt loam and silty clay loam.

Darroch fine sandy loam, neutral variant, 0 to 3 percent slopes (DaA).—This nearly level to very gently sloping soil is in old lakebeds. Some areas have a subsoil texture that ranges to sandy loam or to clay loam. Surface runoff is slow.

If properly drained, this soil has moderate limitations that affect its use for crops. (Capability unit IIIw-3; recreation group 5; wildlife group 12; urban trees group 7)

Dorchester Series

In the Dorchester series are well-drained to moderately well drained soils that developed in recent alluvium consisting of stratified silt loam, loam, and fine sandy loam. These nearly level soils occur along the Fox and Pike Rivers. The native vegetation was hardwoods.

In a typical profile the surface layer is about 11 inches thick. It is calcareous, dark grayish-brown heavy silt loam.

The underlying material is calcareous and extends to a depth of 60 inches. The upper part is dark grayish-brown silt loam about 12 inches thick. Beneath this is a 10-inch layer of stratified very dark grayish-brown and dark-brown heavy silt loam that contains mottles of dark yellowish brown. This is underlain by 9 inches of dark grayish-brown silt loam marked with common dark yellowish-brown mottles. At a depth of 42 inches is a layer of dark grayish-brown loam, about 10 inches thick, that has common dark-gray mottles. Underlying this layer and extending to a depth of 60 inches is dark-gray fine sandy loam marked with many dark-brown mottles.

These soils have very high available moisture capacity, moderate permeability, and medium internal drainage. They are in good tilth and are high in fertility. Roots penetrate to a depth of 5 feet or more.

Typical profile of Dorchester silt loam in a cultivated field (SE¼SE¼ sec. 1, T. 2 N., R. 22 E., Kenosha County):

Ap—0 to 11 inches, dark grayish-brown (10YR 4/2) heavy silt loam; weak, medium, subangular blocky structure that breaks to weak, medium, granular structure; friable; compacted by tillage implements; calcareous (weak effervescence); clear, wavy boundary.

C1—11 to 23 inches, dark grayish-brown (10YR 4/2) silt loam; weak to moderate, medium, subangular blocky structure; friable; calcareous; clear, irregular boundary.

C2—23 to 33 inches, stratified, very dark grayish-brown (10YR 3/2) and dark-brown (10YR 4/2) heavy silt loam; weak to moderate, fine and medium, subangular blocky structure; firm; few, medium, faint mottles of dark yellowish brown (10YR 4/4); calcareous; clear, irregular boundary.

C3—33 to 42 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine to medium, subangular blocky structure; friable; common, medium, distinct mottles of dark yellowish brown (10YR 4/4–4/6); calcareous; clear, irregular boundary.

C4—42 to 52 inches, dark grayish-brown (10YR 4/2) loam; weak, medium, subangular blocky structure; friable; many, medium, distinct mottles of dark brown and strong brown (7.5YR 4/4–4/6); common, fine, faint mottles of dark gray (10YR 4/1); slightly sticky when wet; calcareous; clear, irregular boundary.

C5—52 to 60 inches, dark-gray (10YR 4/1) fine sandy loam; weak, medium, subangular blocky structure; very friable; many, medium, distinct mottles of dark brown (7.5YR 4/4); slightly sticky when wet; calcareous.

To a depth of 52 inches, the color of these soils is basically dark grayish brown (10YR 4/2). Mottling varies but generally appears at a depth of 24 to 42 inches. Layers of sandy material are commonly present at a depth of 40 inches or more.

The Dorchester soils are predominantly dark grayish brown in the upper part of the profile, whereas the Lawson soils, calcareous variant, are very dark brown and very dark grayish brown, and the Sawmill soils, calcareous variant, are black to dark gray. The Dorchester soils do not have the wide range in texture throughout the profile that is typical of Alluvial land.

Dorchester silt loam (0 to 2 percent slopes) (Dh).—This soil occupies alluvial bottoms along the major streams in the survey area. Surface runoff is slow. Included with this soil in mapping are areas of Alluvial land and Lawson soils.

If protected from overflow, this soil is slightly limited for crop use. (Capability unit IIw–13; recreation group 7; wildlife group 1; urban trees group 1)

Dresden Series

The Dresden series consists of well-drained and moderately well drained, loamy soils that have a thin silt mantle over outwash sand and gravel. These nearly level to gently sloping soils occupy flats and drainageways of high terraces, mainly along the major streams in the survey area. The native vegetation was sparse hardwoods and prairie grasses.

In a typical profile the surface layer is mildly alkaline, very dark grayish-brown loam about 9 inches thick.

The subsoil is about 21 inches thick and contains yellowish-brown mottles beginning at a depth of 17 inches. It is mildly alkaline to slightly acid, dark-brown to brown clay loam to a depth of about 26 inches. The lower part of the subsoil is a 4-inch layer of calcareous, dark yellowish-brown gravelly loam.

The underlying material is calcareous, dark yellowish-brown and yellowish-brown, loose sand and gravel.

These soils have medium internal drainage and moderate permeability. The available moisture capacity is moderately high. The fertility of these soils is moderate. Plant roots easily penetrate to the underlying sand and gravel.

Typical profile of Dresden loam, 1 to 3 percent slopes, in a cultivated area (SE¼NE¼ sec. 24 T. 2 N., R. 19 E., Racine County):

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium, granular structure; very friable; mildly alkaline; abrupt, wavy boundary.

B1t—9 to 11 inches, dark-brown to brown (7.5YR 4/4) light clay loam; moderate, fine, subangular blocky structure; friable; worm casts; mildly alkaline; gradual, irregular boundary.

B21t—11 to 17 inches, dark-brown (7.5YR 4/4) clay loam; moderate, fine and medium, subangular blocky structure; firm; thick, continuous clay films; some pebbles, most of them less than 25 millimeters in diameter; slightly acid to neutral; gradual, irregular boundary.

B22t—17 to 20 inches, dark-brown to brown (7.5YR 4/4) heavy clay loam; moderate, medium, subangular blocky structure that breaks to weak, fine, subangular blocky structure; very firm; thick, continuous clay films; few, fine, faint mottles of yellowish brown (10YR 5/6); some pebbles, most of them less than 25 millimeters in diameter; slightly acid; clear, irregular boundary.

B23t—20 to 26 inches, dark-brown to brown (7.5YR 4/2) clay loam; weak to moderate, medium and coarse, subangular blocky structure; firm; thick, continuous clay films; few, medium, faint mottles of yellowish brown (10YR 5/6); numerous pebbles, most of them less than 25 millimeters in diameter; some black (10YR 2/1) iron or manganese concretions; neutral; clear, irregular boundary.

B3—26 to 30 inches, dark yellowish-brown (10YR 3/4) gravelly loam; weak, coarse, subangular blocky structure; friable; common, fine, faint mottles of yellowish brown (10YR 5/4); calcareous; abrupt, irregular boundary.

C—30 to 48 inches +, dark yellowish-brown (10YR 3/4) and yellowish-brown (10YR 5/4) sand and gravel; single grain; loose; gravel to 30 millimeters in diameter; highly calcareous.

The solum ranges from 24 to 40 inches in thickness and is medium acid to moderately alkaline. The silt mantle may be as much as 20 inches thick. Some areas have a silt loam surface layer. Where the upper part of the subsoil has developed from silt, the texture is heavy silt loam to silty clay loam. The part of the subsoil that developed from sand and gravel has clay loam to gravelly loam texture. The underlying material occurs at a depth of 24 to 40 inches. The gravel in this material is largely dolomite.

The Ap layer of the Dresden soils is about 9 inches thick and is very dark grayish brown. Comparison shows that the Ap layer of the Fox soils is about 7 inches thick and is dark grayish brown.

Dresden loam, 1 to 3 percent slopes (DrA).—This soil commonly occurs with Fox and Casco soils along drainageways. Slopes are concave and generally less than 150 feet in length. Surface runoff is slow.

Included with this soil in mapping are areas having a silt loam surface layer, areas where the slope is 4 or 5 percent, and a few small areas that are moderately eroded. The eroded areas have a lighter colored surface layer because tillage has mixed some of the upper subsoil into the plow layer. Also included are some areas of Dresden soil having a sandy loam surface layer. In these areas the available moisture capacity is lower than that of Dresden loam, 1 to 3 percent slopes.

The erosion hazard limits this soil for crop use. In addition, the soil has a medium available moisture capacity and is droughty at times. (Capability unit IIe–2; recreation group 2; wildlife group 1; urban trees group 1)

Drummer Series

The Drummer series consists of loamy, poorly drained soils that developed from a thin silt mantle over outwash sand and gravel. These nearly level soils occur on flats, in depressions, and along drainageways of high terraces. The native vegetation was water-tolerant grasses and shrubs.

In a typical profile the surface layer is neutral, black silt loam about 8 inches thick. The subsurface layer, about 4 inches thick, is neutral, black to very dark gray silt loam.

The subsoil is about 38 inches thick. The upper part of the subsoil is neutral, dark grayish-brown heavy silty clay loam that has many mottles of yellowish brown. It is underlain by neutral, grayish-brown silty clay loam that has common mottles of yellowish brown. This is underlain by mildly alkaline, light brownish-gray silty clay loam that has common mottles of yellowish brown. The lower subsoil is calcareous, dark-gray light clay loam.

The underlying material is calcareous, dark-gray to gray very coarse sand and gravel.

These soils have high available moisture capacity, moderate permeability, and very slow internal drainage. The tilth of these soils is good, and fertility is high. Roots readily penetrate to the water table, or to the sand and gravel if drainage measures are used.

Typical profile of Drummer silt loam, gravelly substratum, in a cultivated area (SE¼NW¼ sec. 14, T. 3 N., R. 19 E., Racine County):

Ap—0 to 8 inches, black (10YR 2/1) silt loam; moderate, medium, subangular blocky structure that breaks to moderate, medium, granular structure; very friable; neutral; clear, wavy boundary.

A1—8 to 12 inches, black (10YR 2/1) to very dark gray (10YR 3/1) silt loam; moderate, medium, subangular blocky structure that breaks to weak, medium, granular structure; very friable; tongues extending to 15 inches; neutral; clear, irregular boundary.

B21g—12 to 19 inches, dark grayish-brown (2.5Y 4/2) heavy silty clay loam; weak, medium, angular blocky structure that breaks to moderate, medium, angular blocky structure; firm; many, medium, prominent mottles of yellowish brown (10YR 5/6); neutral; clear, irregular boundary.

B22g—19 to 27 inches, grayish-brown (2.5Y 5/2) silty clay loam; weak, fine to medium, prismatic structure that breaks to moderate, medium, angular blocky structure; firm; common, medium, prominent mottles of yellowish brown (10YR 5/6); neutral; clear, irregular boundary.

B31g—27 to 38 inches, light brownish-gray (2.5Y 6/2) silty clay loam; weak, medium, subangular blocky structure; sticky when wet; common, fine, prominent mottles of yellowish brown (10YR 5/6); mildly alkaline; clear, irregular boundary.

IIB32g—38 to 50 inches, dark-gray (5Y 4/1) light clay loam; massive in place, breaking to weak, medium, subangular blocky structure; sticky when wet; abundant, partly decomposed root hairs and stems; calcareous; abrupt, wavy boundary.

IIC—50 to 60 inches +, dark-gray (10YR 4/1) to gray to light-gray (10YR 6/1) very coarse sand and gravel; single grain; nonsticky when wet; calcareous.

The solum ranges from 40 to 56 inches or more in thickness and is neutral to mildly alkaline. The silt mantle ranges from 36 to 50 inches in thickness. Most of the solum has formed in silty material. The thickness of the surface layer varies from 8 to about 16 inches. The underlying material generally consists of stratified sand and gravel but in places is dominantly sand.

The Drummer soils have a black A horizon rather than the dark-gray to brown A horizon of the St. Charles soils. The solum of the Drummer soils has gray colors and mottling that are lacking in the St. Charles soils.

Drummer silt loam, gravelly substratum (0 to 2 percent slopes) (Dt).—This soil lies on flats, along drainageways, and in depressions. Surface runoff is ponded to very slow. Included with this soil in mapping are some small areas that have slopes of 2 to 3 percent. Also included are a few small areas that are underlain by clay layers at a depth of 42 inches or more.

If drained, this soil has only slight limitations that affect its use for crops. (Capability unit IIw–1; recreation group 6; wildlife group 5; urban trees group 7)

Elliott Series

The Elliott series is made up of somewhat poorly drained soils that developed from a thin silt mantle and the underlying clay loam to silty clay loam glacial till. These nearly level to gently sloping soils occupy drainageways, depressions, and foot slopes. The native vegetation was prairie grasses.

In a typical profile the surface layer is slightly acid, black silty clay loam about 10 inches thick.

The subsoil is about 20 inches thick. The upper part is neutral, very dark grayish-brown silty clay loam. The middle part of the subsoil is neutral, dark grayish-brown to dark-brown clay. The lower part is mildly alkaline, brown to dark-brown silty clay mottled with brown and strong brown.

The calcareous, brown underlying material is about 15 inches thick. It is composed of about 13 inches of silty clay overlying about 2 inches of silty clay loam. Many yellowish-brown and grayish-brown mottles and some shale fragments are in this material.

The Elliott soils have very high available moisture capacity, moderately slow permeability, and moderately slow internal drainage. If cultivated or pastured when wet, these soils tend to puddle and dry to hard clods. Roots penetrate to the water table, which, seasonally, is less than 3 feet below the soil surface. The fertility of these soils is high.

Typical profile of Elliott silty clay loam, 2 to 6 percent slopes, in a cultivated field (NW¼NW¼ sec. 34, T. 3 N., R. 22 E., Racine County):

Ap—0 to 10 inches, black (10YR 2/1) silty clay loam; moderate, medium, subangular blocky structure that breaks to moderate, fine, granular structure; friable; plentiful plant roots; many earthworm casts and holes; slightly acid; abrupt, smooth boundary.

B1—10 to 16 inches, very dark grayish-brown (10YR 3/2) silty clay loam; moderate, fine, subangular blocky structure; firm; plentiful plant roots; a few earthworm holes and casts; black (10YR 2/1) organic stains on ped faces; neutral; clear, wavy boundary.

IIB2t—16 to 23 inches, dark grayish-brown (10YR 4/2) to dark-brown (10YR 4/3) clay; moderate, medium, prismatic structure that breaks to moderate to strong, fine, angular blocky structure; hard when dry and plastic when wet; plentiful plant roots; few, medium, distinct, very dark brown (10YR 2/2) organic stains; prominent, continuous clay films; few glacial pebbles that are mostly dolomite; neutral; clear, wavy boundary.

IIB3t—23 to 30 inches, brown (7.5YR 5/4) to dark-brown (10YR 4/3) silty clay; moderate, medium, prismatic structure that breaks to moderate, medium, angular blocky structure; slightly hard when dry and plastic when wet; grayish-brown (2.5Y 5/2) clay films and black (10YR 2/1) organic stains on ped faces; many, medium, distinct mottles of brown (7.5YR 5/2) and strong brown (7.5YR 5/6); some pebbles and shale fragments; mildly alkaline; gradual, irregular boundary.

IIC1—30 to 43 inches, brown (10YR 5/3) light silty clay; moderate, medium, prismatic structure that breaks to moderate, medium, angular blocky structure; slightly hard when dry and plastic when wet; many, medium, distinct mottles of yellowish brown (10YR 5/6) and grayish brown (10YR 5/2); some grayish-brown (2.5Y 5/2) clay films on vertical ped faces; white (10YR 8/2) streaks of soft lime concentrations; few pebbles and shale fragments; highly calcareous; gradual, irregular boundary.

IIC2—43 to 45 inches, brown (10YR 5/3) silty clay loam; massive; slightly hard when dry and plastic when wet; many, medium, distinct mottles of yellowish brown (10YR 5/6) and grayish brown (10YR 5/2); few pebbles and shale fragments; highly calcareous.

The texture of the surface layer is dominantly silty clay loam, but in places it ranges to heavy silt loam. The texture of the subsoil ranges from silty clay loam to clay, and the underlying material varies from clay loam to silty clay. The solum ranges from 24 to 36 inches in thickness, and the silt mantle is 10 to 20 inches thick. The calcium carbonate equivalent of the glacial till ranges from 25 to 35 percent. Reaction of the solum is mildly alkaline to slightly acid.

The surface layer of the Elliott soils is black and 10 inches thick, whereas that of the Blount soils is black to very dark brown and 5 inches thick.

Elliott silty clay loam, 0 to 2 percent slopes (EtA).—This soil lies along drainageways and in similar places. It occurs extensively throughout the survey area. Small areas of Aztalan, Beecher, and Ashkum soils are included with this soil in mapping. Runoff is very slow, and there is little or no erosion hazard.

If this soil is drained, crops can be successfully grown. (Capability unit IIw-2; recreation group 5; wildlife group 4; urban trees group 6)

Elliott silty clay loam, 2 to 6 percent slopes (EtB).—This soil occurs along drainageways, in depressions, and on foot slopes. It generally lies between the moderately well drained Varna or Markham soils and the poorly drained Ashkum soils. In many areas the drainageways occupied by this soil extend into areas of the Varna and Markham soils in an irregular pattern. This soil has the profile described as typical for the series. Runoff is slow, and the erosion hazard is slight.

Included with this soil in mapping are small areas of Aztalan silt loam and loam, Beecher silt loam, and Ashkum silty clay loam.

If this Elliott soil is properly drained, its use for crops is only slightly limited. (Capability unit IIw–2; recreation group 5; wildlife group 4; urban trees group 6)

Fabius Series

In the Fabius series are nearly level to gently sloping, somewhat poorly drained, loamy soils that are underlain by outwash sand and gravel. These soils occur on flats, on slopes, and along drainageways of high terraces near the major streams in the survey area. The native vegetation was sparse hardwoods and prairie grasses.

In a typical profile the surface layer is neutral, very dark grayish-brown loam about 8 inches thick.

The subsoil is about 11 inches thick. The upper part is neutral, dark yellowish-brown clay loam that has a few yellowish-brown mottles. The middle part of the subsoil is alkaline, dark yellowish-brown clay loam containing common dark-gray and yellowish-brown mottles. The lower part is alkaline, dark grayish-brown gravelly loam that is marked with common dark-gray and brown mottles.

The underlying material is calcareous, loose sand and gravel that are dominantly dark grayish brown. Yellowish-brown mottles are common.

These soils have medium surface runoff, moderate permeability, and slow internal drainage. Available moisture capacity is medium, and fertility is low. Tilth is not a problem. Roots readily penetrate to the water table or, if the soil is drained, to the underlying sand and gravel.

Typical profile of Fabius loam, 1 to 3 percent slopes, in a cultivated area (SW¼SE¼ sec. 23, T. 4 N., R. 22 E., Racine County):

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium, subangular blocky structure that breaks to moderate, medium, granular structure; friable; neutral; clear, wavy boundary.

B21t—8 to 14 inches, dark yellowish-brown (10YR 4/4) clay loam; weak, medium, subangular blocky structure that breaks to moderate, fine, subangular blocky structure; firm; few, fine, faint mottles of yellowish brown (10YR 5/6); neutral; clear, irregular boundary.

B22t—14 to 17 inches, dark yellowish-brown (10YR 4/4) clay loam; weak to moderate, medium, subangular blocky structure; firm; common, medium, distinct mottles of dark gray (10YR 4/1) and yellowish brown (10YR 5/6); complete clay films on ped faces; high percentage of gravel; mildly alkaline; clear, irregular boundary.

B3—17 to 19 inches, dark grayish-brown (10YR 4/2 to 2.5Y 4/2) gravelly loam; weak, coarse, subangular blocky structure; friable; common, medium, distinct mottles of dark gray (10YR 4/1) and brown (7.5YR 5/4); mildly alkaline; abrupt, irregular boundary.

C—19 to 48 inches, sand and gravel, generally having a dark grayish-brown (10YR 4/2) matrix; single grain; loose; colors range from light brownish gray (10YR 6/2) to dark gray (N 4/0); common, fine, distinct mottles of yellowish brown; calcareous.

The solum of these soils ranges from 12 to 24 inches in thickness but is generally 16 to 20 inches thick. It is neutral to mildly alkaline. In most places the entire solum developed from sand and gravel. In small areas the surface layer is silt loam. The texture of the subsoil ranges from clay loam to gravelly loam. Gravel in the underlying material is mainly dolomite.

The Fabius soils differ from the Casco soils in having a thicker and darker surface layer and in having mottling in the subsoil. The Ap layer of the Fabius soils is very dark grayish brown and about 8 inches thick. Comparison shows that the Ap layer of the Casco soils is about 6 inches thick and is dark brown to brown. Fabius soils do not have the gray colors of the poorly drained Mussey soils.

Fabius loam, 1 to 3 percent slopes (FaA).—This soil occupies foot slopes and drainageways of high terraces. Included with it in mapping are areas having a sandy loam or a silt loam surface layer and areas having slopes of 4 to 5 percent.

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If properly drained, this soil has moderate limitations for crop use. Its fertility is low, and the available moisture capacity is medium. (Capability unit IIIw–5; recreation group 5; wildlife group 12; urban trees group 6)

Fox Series

The Fox series is made up of well-drained, loamy soils that are underlain by outwash sand and gravel. These nearly level to sloping soils occupy terraces near the major streams in the survey area and along the glacial lake beach lines that parallel the Lake Michigan shoreline. The native vegetation was hardwood forest.

In a typical profile the surface layer is neutral, dark grayish-brown silt loam about 7 inches thick. The subsurface layer, about 4 inches thick, is neutral, brown silt loam.

The subsoil is about 24 inches thick. The upper part is neutral to strongly acid, dark-brown to brown silty clay loam. This is underlain by strongly acid to medium acid, brown to dark-brown clay loam in which pebbles are abundant. The lower part of the subsoil is slightly acid to neutral, dark-brown to brown sandy clay loam.

The underlying material is calcareous, grayish-brown, stratified sand and gravel.

These soils have medium available moisture capacity, moderate permeability, and medium internal drainage. Their fertility is moderate. Plant roots readily penetrate to the sand and gravel that occur at a depth of 20 to 40 inches.

Typical profile of Fox silt loam, 2 to 6 percent slopes, in a cultivated field (SW¼NW¼ sec. 19, T. 2 N., R. 19 E., Racine County):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A2—7 to 11 inches, brown (10YR 5/3) silt loam; weak, thin, platy structure that breaks to weak, medium, granular structure; friable; neutral; clear, wavy boundary.

B1—11 to 14 inches, dark-brown to brown (10YR 4/3) silty clay loam; moderate, fine, subangular blocky structure; firm; slightly acid to neutral; gradual, wavy boundary.

B21—14 to 18 inches, dark-brown to brown (10YR 4/3) heavy silty clay loam; moderate, fine, angular blocky structure; very firm; patchy clay films; some very dark grayish-brown (10YR 3/2) coatings; strongly acid to medium acid; clear, wavy boundary.

IIB22—18 to 30 inches, brown (7.5YR 5/4) to dark-brown (7.5YR 4/4) clay loam; moderate, medium, angular blocky structure; very firm; continuous clay films; abundant pebbles, most of them less than 20 millimeters in diameter; very dark grayish-brown (10YR 3/2) coatings; strongly acid to medium acid; clear, irregular boundary.

IIB3—30 to 35 inches, dark-brown to brown (7.5YR 4/4) sandy clay loam; weak, medium, subangular blocky structure; firm; patchy clay films; slightly acid to neutral; clear, irregular boundary.

IIC—35 to 60 inches +, grayish-brown (10YR 5/2), stratified outwash sand and gravel; very dark grayish-brown (10YR 3/2) and pale-brown (10YR 6/3) sand grains; single grain; loose when moist; calcareous.

The solum ranges from 24 to 40 inches in thickness and is strongly acid to neutral. The silt layer is absent in some Fox soils and is as much as 20 inches thick in others. The surface layer is sandy loam, loam, or silt loam. Fox sandy loams have a sandy clay loam to light clay loam subsoil that ranges from 10 to 18 inches in thickness. The sandy loams generally are underlain by medium sand rather than stratified sand and gravel. Undisturbed sites have a very dark grayish-brown (10YR 3/2) to dark grayish-brown (10YR 4/2) surface layer that is 4 to 6 inches thick. The percentage of dolomite gravel in the underlying material is very high.

The Fox soils are more than 20 inches deep over sand and gravel, whereas the Casco soils are only 12 to 20 inches deep over the same kinds of material.

Fox loam, 0 to 2 percent slopes (FoA).—This soil occupies terraces near the major streams in the survey area. It commonly occurs with Casco soils and other Fox soils. This soil has a thicker surface layer and subsoil and a coarser textured surface layer than the soil described as typical for the series. Runoff is very slow, and there is little or no hazard of erosion.

Included with this soil in mapping are small areas of Fox silt loam, Casco loam, Dresden loam, and Fox loam, clayey substratum.

Because the root zone is moderately deep, this soil has slight limitations for crop use. (Capability unit IIs–1; recreation group 2; wildlife group 1; urban trees group 1)

Fox loam, 2 to 6 percent slopes (FoB).—This soil occupies terraces and glacial beach lines that parallel the Lake Michigan shoreline. It commonly occurs with Casco soils and other Fox soils. The surface layer is coarser textured than that of the soil described in the typical profile. Runoff is slow, and the erosion hazard is slight.

Included in mapping are small areas of Fox silt loam, Casco loam, and Fox loam, clayey substratum. Also included are some moderately eroded areas.

Because this soil is gently sloping and has a slight erosion hazard, its use for crops is slightly limited. (Capability unit IIe–2; recreation group 2; wildlife group 1; urban trees group 1)

Fox loam, 6 to 12 percent slopes, eroded (FoC2).—This slightly to moderately eroded soil lies on terraces. It commonly occurs with Casco soils and other Fox soils. The surface layer of this sloping soil is thinner, coarser textured, and lighter colored than that described as typical for the series. As much as two-thirds of the original surface layer has been removed through erosion. Runoff is medium, and the hazard of erosion is moderate.

Included with this soil in mapping are small areas of Fox silt loam and Casco loam and a few acres of severely eroded Fox loam having slopes of 6 to 12 percent.

Slope and the resulting erosion hazard moderately limit this soil for crop use. A medium available moisture capacity also affects crop yields. (Capability unit IIIe–1; recreation group 2; wildlife group 1; urban trees group 1)

Fox loam, clayey substratum, 0 to 2 percent slopes (FrA).—This soil occupies terraces near the major streams in the survey area. It differs from the soil described as typical for the series because it has a slightly coarser textured surface layer and a thicker surface layer and subsoil. This soil also differs from the typical soil in having underlying material of clay loam to clay at a depth of 42 inches or more. Runoff is very slow, and there is little or no hazard of erosion.

Included with this soil in mapping are small areas of Hebron loam, Fox sandy loam, and Fox silt loam.

Because the root zone is only moderately deep, the use of this soil for crops is slightly limited. (Capability unit IIs–1; recreation group 2; wildlife group 1; urban trees group 1)

Fox loam, clayey substratum, 2 to 6 percent slopes (FrB).—This soil lies on terraces near the major streams in the survey area. It differs from the soil described as typical for the series because it has a coarser textured surface layer and a clayey lower substratum at a depth of 42 inches or more. The texture of the clayey substratum ranges from clay loam to clay. Runoff is slow, and the risk of erosion is slight.

Included with this soil in mapping are small areas of Hebron loam, Fox sandy loam, and Fox silt loam.

Because of gentle slopes and the resulting erosion hazard, this soil has slight limitations for crop use. (Capability unit IIe–2; recreation group 2; wildlife group 1; urban trees group 1)

Fox sandy loam, 1 to 6 percent slopes (FmB).—This soil occupies terraces and beach lines that parallel the Lake Michigan shoreline. Areas commonly occur with Casco soils and other Fox soils. This soil has a coarser textured surface layer than the soil described as typical for the series. Erosion is a slight hazard.

Included with this soil in mapping are small areas of moderately eroded Fox sandy loam and Casco sandy loam.

Low fertility and medium available moisture capacity are moderate limitations that affect use of this soil for crops. (Capability unit IIIe–4; recreation group 2; wildlife group 1; urban trees group 3)

Fox sandy loam, 6 to 12 percent slopes, eroded (FmC2).—This soil lies on terraces near the major streams in the survey area. It commonly occurs with Casco soils and other Fox soils. It has a coarser textured surface layer and is thinner in the surface layer and subsoil than the soil described as typical for the series. Up to two-thirds of the original surface layer of this sloping soil has been removed through erosion. Runoff is medium, and the hazard of erosion is moderate.

Included with this soil in mapping are small areas having a loam surface layer. Also included are areas of slightly eroded or severely eroded Fox sandy loam and Casco sandy loam.

The slope and resulting erosion hazard moderately limit use of the soil for crops. Low fertility and medium available moisture capacity may also affect crop growth. (Capability unit IIIe–1; recreation group 2; wildlife group 1; urban trees group 3)

Fox silt loam, 0 to 2 percent slopes (FsA).—This soil occupies terraces along the major streams in the survey area. It commonly occurs with Casco soils and other Fox soils. This soil has a thicker surface layer and subsoil than the soil described as typical for the series. Runoff is slow, and there is little or no hazard of erosion.

Included with this soil in mapping are small areas of Fox loam, Casco silt loam, Dresden silt loam, and Fox loam, clayey substratum.

Because the root zone of this soil is restricted to the solum, crop use is slightly limited. (Capability unit IIs–1; recreation group 1; wildlife group 1; urban trees group 1)

Fox silt loam, 2 to 6 percent slopes (FsB).—This soil occupies terraces and commonly occurs with Casco soils and other Fox soils. It has the profile described as typical for the series. Runoff is slow, and the hazard of erosion is slight.

Included with this soil in mapping are small areas of Fox loam; Fox loam, clayey substratum; Fox silt loam, moderately eroded; and Casco loam.

Because of gentle slopes, this soil has slight limitations that affect its use for crops. (Capability unit IIe–2; recreation group 1; wildlife group 1; urban trees group 1)

Granby Series

The Granby series consists of poorly drained and very poorly drained soils that developed from stratified sandy outwash. These nearly level soils occur on flats, along drainageways, and in depressions. The native vegetation was water-tolerant grasses and shrubs.

In a typical profile the surface layer is about 8 inches thick and is neutral, black fine sandy loam. It is overlain by a layer of neutral, black muck about 4 inches thick.

The upper part of the subsoil, about 3 inches thick, is neutral, very dark gray loamy fine sand that contains many mottles. The lower part is about 7 inches thick and is grayish-brown fine and medium sand containing yellowish-red mottles.

The underlying material is neutral, light brownish-gray sand that becomes calcareous gray sand at about 38 inches.

These soils have a high water table. They are medium in available moisture capacity. They have ponded to slow surface runoff, moderately rapid permeability, and slow internal drainage. The tilth of these soils is good, and their fertility is low. Roots penetrate to the water table, which, seasonally, is less than 1 foot below the soil surface.

Typical profile of Granby fine sandy loam in an undisturbed area (NE¼NE¼ sec. 30, T. 1 N., R. 23 E., Kenosha County):

02—4 inches to 0, black (N 2/0) muck; fine granular structure; very friable; neutral; abrupt, smooth boundary.

A1—0 to 8 inches, black (N 2/0) fine sandy loam; moderate, fine, subangular blocky structure that breaks to moderate, medium, granular structure; very friable; neutral; clear, smooth boundary.

B21g—8 to 11 inches, very dark gray (N 3/0) loamy fine sand; weak, fine, subangular blocky structure; very friable; many, fine, distinct mottles of dark brown to brown (7.5YR 4/4), strong brown (7.5YR 5/6–5/8), and pinkish gray (7.5YR 6/2); neutral; clear, smooth boundary.

B22g—11 to 18 inches, grayish-brown (10YR 5/2) fine and medium sand; weak subangular blocky structure; friable; loose; many, medium, distinct mottles of yellowish red (5YR 5/6); neutral; clear, smooth boundary.

C1—18 to 38 inches, light brownish-gray (10YR 6/2) medium sand; single grain; loose; neutral; clear, smooth boundary.

C2—38 to 60 inches, gray (5Y 5/1) medium sand; single grain; loose; calcareous.

The texture of the underlying material ranges from fine to coarse sand.

The B horizon of the Granby soils is loamy fine sand to fine and medium sand, whereas the B horizon of the Colwood soils is silty clay loam.

Granby fine sandy loam (0 to 2 percent slopes) (Gf).—This soil occupies drainageways and depressions. It has the profile described as typical for the series. Some areas included with this soil in mapping have a loamy fine sand or a loam surface layer. Also included are areas where the underlying material contains very fine sand and silt layers.

If drained, this soil has moderate limitations for crop use. Low fertility and medium available moisture capacity also affect growth of crops. (Capability unit IIIw–5; recreation group 6; wildlife group 5; urban trees group 7)

Granby fine sandy loam, loamy substratum (0 to 2 percent slopes) (Gm).—This soil occurs along drainageways and in depressions. Unlike the soil described as typical for the series, it has a layer of sandy loam to light clay loam at a depth of 36 inches or more. Included with this soil in mapping are areas where the underlying material contains layers of very fine sand and silt.

If drained, this soil is moderately limited for crop use. Low fertility and medium available moisture capacity restrict crop growth. (Capability unit IIIw–5; recreation group 6; wildlife group 5; urban trees group 7)

Granby Series, Brown Subsoil Variant

The Granby series, brown subsoil variant, is made up of somewhat poorly drained soils that developed from stratified sandy outwash. These nearly level to gently sloping soils occur on flats, along drainageways, and in depressions. The native vegetation was prairie grasses.

In a typical profile the surface layer is mildly alkaline, black fine sandy loam about 8 inches thick. The subsurface layer, about 2 inches thick, is neutral, very dark grayish-brown loamy fine sand that has dark yellowish-brown mottles.

Below the subsurface layer is neutral, dark-brown to dark yellowish-brown fine sand that is mottled with strong brown and dark gray to light gray. The underlying material is pale brown and calcareous at a depth of about 28 inches.

These soils have low available moisture capacity, moderately rapid permeability, and slow internal drainage. The tilth of these soils is good, and their fertility is moderate. Roots penetrate to the water table. Seasonally, the water table is less than 3 feet below the soil surface.

Typical profile of Granby fine sandy loam, brown subsoil variant, 0 to 3 percent slopes, in an undisturbed area (SW¼SW¼ sec. 29, T. 1 N., R. 23 E., Kenosha County):

A11—0 to 8 inches, black (10YR 2/1) fine sandy loam; moderate, medium, granular structure; very friable; high percentage of organic matter; mildly alkaline; abrupt, irregular boundary.

A12—8 to 10 inches, very dark grayish-brown (10YR 3/2) loamy fine sand; weak, medium, granular structure; very friable; few, fine, distinct mottles of dark yellowish brown (10YR 4/4); neutral; clear, irregular boundary.

C1—10 to 16 inches, dark-brown (10YR 4/3) to dark yellowish-brown (10YR 4/4) fine sand; single grain; loose; many, coarse, prominent mottles of strong brown (7.5YR 5/6); some blotches of very dark grayish brown (10YR 3/2); neutral; clear, irregular boundary.

C2g—16 to 28 inches, light yellowish-brown (10YR 6/4) fine sand; single grain; loose; common, medium, prominent mottles of strong brown (7.5YR 5/6), dark gray (10YR 4/1), and light gray (10YR 7/2); neutral; gradual, irregular boundary.

C3—28 to 54 inches +, pale-brown (10YR 6/3) fine sand; single grain; loose; common, medium, prominent mottles of strong brown (7.5YR 5/6), dark gray (10YR 4/1), and light gray (10YR 7/2); calcareous.

The texture of the surface layer is loamy sand or fine sandy loam. The texture of the underlying material ranges from fine sand to coarse sand.

Granby soils, brown subsoil variant, do not have the loam to silty clay loam subsoil present in Darroch and Mundelein soils. The Granby soils have fine sand underlying material, whereas the Darroch and Mundelein soils are underlain by laminated silt, very fine sand, and fine sand.

Granby fine sandy loam, brown subsoil variant, 0 to 3 percent slopes (GrA).—This soil occupies drainageways and depressions. Surface runoff is slow. Included with this soil in mapping are small areas having a loamy sand surface layer.

For the best growth of crops, this soil needs open ditch drains. The low available moisture capacity and low fertility affect productivity. (Capability unit IIIw–5; recreation group 5; wildlife group 12; urban trees group 7)

Griswold Series

The Griswold series is made up of well-drained, loamy soils that developed in sandy loam glacial till that, in places, is overlain by a thin mantle of silt. These gently sloping to sloping soils occupy ridges and knobs in northwestern Racine County. They commonly occur with the Ringwood soils. The native vegetation was prairie grasses.

In a typical profile the surface layer is neutral, very dark grayish-brown loam about 8 inches thick. The subsurface layer, about 2 inches thick, is neutral, very dark grayish-brown and dark yellowish-brown loam.

The subsoil is about 15 inches thick. The upper part is neutral, dark yellowish-brown sandy clay loam. The lower part is calcareous, dark yellowish-brown heavy loam.

The underlying material is calcareous, yellowish-brown heavy sandy loam.

These soils have medium available moisture capacity, moderate permeability, and medium internal drainage. Their fertility is moderate. Plant roots readily penetrate the sandy loam glacial till to a depth of 5 feet.

Typical profile of Griswold loam, 2 to 6 percent slopes, in a cultivated field (SE¼NW¼ sec. 3, T. 4 N., R. 19 E., Racine County):

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium, granular structure; very friable; neutral; abrupt, smooth boundary.

AB—8 to 10 inches, very dark grayish-brown (10YR 3/2) and dark yellowish-brown (10YR 3/4) loam; weak, fine, subangular blocky structure that breaks to moderate, medium, granular structure; very friable; earthworm casts; neutral; clear, wavy boundary.

B2t—10 to 18 inches, dark yellowish-brown (10YR 4/4) sandy clay loam; moderate, medium, subangular blocky structure; firm; dark-brown (10YR 3/3) patchy clay films; neutral; gradual, wavy boundary.

B3—18 to 25 inches, dark yellowish-brown (10YR 3/4–4/4) heavy loam; weak, medium, subangular blocky structure; friable; a few dark-brown (10YR 3/3) stains on ped faces; calcareous; gradual, wavy boundary.

C—25 to 60 inches +, yelowish-brown (10YR 5/4 heavy sandy loam; massive; very friable; highly calcareous.

The solum ranges from 24 to 36 inches in thickness and is slightly acid to moderately alkaline. Because the silt mantle is 0 to 12 inches thick, all or most of the solum formed from glacial till. The surface layer ranges from very dark grayish brown (10YR 3/2) to black (10YR 2/1) in color and from 10 to 15 inches in thickness. In places the underlying material includes layers of water-sorted sand and gravel.

The Griswold subsoil has developed mostly from glacial till, whereas the Ringwood subsoil has developed mainly from the overlying silt mantle.

Griswold loam, 2 to 6 percent slopes (GsB).—This soil occupies ridges and knobs in areas of heavy sandy loam glacial till. Slopes are convex and generally less than 300 feet in length. This soil has the profile described as typical for the series. It commonly occurs with other Griswold soils and with Ringwood soils. Runoff is slow, and the erosion hazard is slight.

Included with this soil in mapping are areas where the solum is less than 20 inches thick. Also included are areas that are moderately eroded.

Gentle slopes slightly limit this soil for crop use. (Capability unit IIe–1; recreation group 2; wildlife group 3; urban trees group 1)

Griswold loam, 6 to 12 percent slopes, eroded (GsC2).—This soil occupies ridges and knobs in areas of heavy sandy loam glacial till. It commonly occurs with other Griswold soils and with Ringwood soils. Slopes are convex and generally less than 400 feet in length. This soil has a thinner surface layer and subsoil than the soil described as typical for the series. It has lost more soil material through erosion, and some of the upper subsoil has been mixed into the plow layer, making the soil lighter in color than is typical. Runoff is medium, and the hazard of erosion is moderate.

Included with this soil in mapping are areas having a surface layer and subsoil less than 20 inches thick and areas that are only slightly eroded.

Slopes and the resulting erosion hazard are moderate limitations that affect use of this soil for crops. (Capability unit IIIe–1; recreation group 2; wildlife group 3; urban trees group 1)

Hebron Series

The Hebron series consists of loamy, well-drained soils that developed from outwash material underlain by laminated lacustrine silt and clay or by clayey glacial till. These nearly level to moderately steep soils occur on flats, foot slopes, ridges, and knobs. The native vegetation was hardwood forest.

In a typical profile the surface layer is mildly alkaline, very dark grayish-brown loam about 6 inches thick. The subsurface layer, about 5 inches thick, is mildly alkaline, brown loam.

The subsoil is about 17 inches thick. The upper part is neutral, dark-brown to brown heavy loam to clay loam. This is underlain by neutral, dark yellowish-brown gravelly loam that contains a few dark-brown to brown mottles. The lower subsoil is mildly alkaline, yellowish-brown silty clay loam that has a few mottles of strong brown.

The underlying material is calcareous, light yellowish-brown silty clay loam that contains many mottles of yellowish brown and grayish brown.

These soils have high available moisture capacity, slow permeability, and slow internal drainage. The tilth of these soils is good, and their fertility is moderate. Roots readily penetrate to a depth of 24 to 40 inches.

Typical profile of Hebron loam, 0 to 2 percent slopes, in a cultivated area (NE¼NW¼ sec. 14, T. 4 N., R. 22 E., Racine County):

Ap—0 to 6 inches, dark grayish-brown to very dark grayish-brown (10YR 4/2–3/2) loam; weak, coarse, subangular blocky structure that breaks to moderate, medium, granular structure; friable; mildly alkaline; abrupt, wavy boundary.

A2—6 to 11 inches, brown (10YR 5/3) loam; moderate, medium, platy structure; friable; mildly alkaline; clear, wavy boundary.

B1—11 to 16 inches, dark-brown to brown (10YR 4/3) heavy loam; weak to moderate, medium, subangular blocky structure; friable; neutral; clear, irregular boundary.

B21t—16 to 20 inches, dark-brown to brown (10YR 4/3–7.5YR 3/2) clay loam; moderate to strong, medium, subangular blocky structure; very firm; neutral; clear, irregular boundary.

B22—20 to 24 inches, dark yellowish-brown (10YR 4/4) gravelly loam; moderate, fine, subangular blocky structure; firm; prominent patchy clay films; few, fine, faint mottles of dark brown to brown (7.5YR 4/4); neutral; abrupt, wavy boundary.

IIB23t—24 to 28 inches, yellowish-brown (10YR 5/4) heavy silty clay loam; moderate, medium, angular blocky structure; very firm; thick, continuous clay films; few, large, faint mottles of strong brown (7.5YR 5/6); some pebbles, most of them less than 25 millimeters in diameter; mildly alkaline; clear, irregular boundary.

IIC—28 to 48 inches +, light yellowish-brown (10YR 6/4) silty clay loam; moderate, thick, platy structure; laminated; firm; many, medium, distinct mottles of yellowish brown (10YR 5/6) and grayish brown (10YR 5/2); highly calcareous.

The thickness of the solum ranges from 20 to 40 inches. The A horizon ranges from very dark grayish brown (10YR 3/2) to grayish brown (10YR 5/2) in color and is silt loam, loam, or sandy loam. Outwash and lacustrine materials generally are in the lower part of the B horizon. In places, as much as 6 inches of leached outwash material is between the solum and underlying clayey material. In this survey area, the C horizon consists of silty clay loam to clay lacustrine sediments or clay loam to silty clay loam glacial till. Lenses of fine sand or silt are at depths of 36 inches or more.

The Hebron soils are loamy and well drained, as are the Symerton soils. The A horizon of the Hebron soils, however, is 11 inches thick and dark grayish brown to brown, as compared to an A horizon in the Symerton soils that is 15 inches thick and black to very dark grayish brown.

Hebron loam, 0 to 2 percent slopes (HeA).—This soil occurs on flats in old lakebeds. It has the profile described as typical for the series. Runoff is very slow, and there is little or no hazard of erosion.

Included with this soil in mapping are areas of Fox loam, clayey substratum. Also included are areas having a silt loam surface soil.

This soil is slightly limited for crop use because plant roots do not readily penetrate the clayey lake-laid material or glacial till that is in the lower subsoil and underlying material. (Capability unit IIs–7; recreation group 2; wildlife group 1; urban trees group 1)

Hebron loam, 2 to 6 percent slopes, eroded (HeB2).—This eroded soil has lost as much as two-thirds of the original surface layer through erosion. It occupies foot slopes, ridges, and knobs in lake-laid soil areas. It has a lighter colored and thinner surface layer than that described as typical for the series. Tillage has mixed some of the upper subsoil into the surface layer. This gently sloping soil also differs from the typical soil in having a thinner subsoil and generally no mottling. The hazard of erosion is slight.

Included in mapping are slightly eroded spots that have a silt loam surface layer.

The gentle slopes slightly limit the use of this soil for crops. Plant roots do not readily penetrate the clayey lake-laid sediments or glacial till of the lower subsoil and underlying material. (Capability unit IIe–6; recreation group 2; wildlife group 1; urban trees group 1)

Hebron loam, 6 to 12 percent slopes, eroded (HeC2).—This slightly to moderately eroded soil occurs on ridges and knobs in lake-laid soil areas. It has a lighter colored surface layer than that described as typical for the series because tillage has mixed some of the upper subsoil into the surface layer. This sloping soil also differs from the typical in having a thinner surface layer, a thinner subsoil, and no mottling. As much as two-thirds of the original surface layer has been removed through erosion. The hazard of erosion is moderate.

Included with this soil in mapping are small areas of slightly eroded or moderately eroded Hebron soils that occupy steeper slopes. Also included are some areas that have a sandy loam or a silt loam surface layer.

Slopes and the resulting erosion hazard are moderate limitations that affect use of this soil for crops. (Capability unit IIIe–6; recreation group 2; wildlife group 1; urban trees group 1)

Hebron sandy loam, 2 to 6 percent slopes (HbB).—This soil occurs on foot slopes, ridges, and knobs in lake-laid soil areas. It has a lighter colored and coarser textured surface layer than that described as typical for the series. It also differs from the typical soil in having a thinner surface layer and subsoil and, in some places, no mottling in the B and C horizons. Runoff is slow, and the erosion hazard is slight.

Included with this soil in mapping are small areas of Hebron sandy loam having slopes of 0 to 2 percent and small areas of Casco, Boyer, and Dresden soils that have a clayey substratum.

This soil is moderately limited for crop use because of slope and the resulting erosion hazard. It also is droughty, and the clayey lower B or upper C horizon may restrict the growth of plant roots. (Capability unit IIe–6; recreation group 2; wildlife group 1; urban trees group 3)

Hochheim Series

The Hochheim series consists of well-drained, loamy soils that developed in gravelly loam glacial till that is high in carbonates and, in places, is overlain by a thin mantle of silt. These gently sloping to moderately steep soils occur on ridges and drumlins in Waterford, Rochester, and Burlington Townships in Racine County. The native vegetation was hardwoods.

In a typical profile the surface layer is neutral, very dark grayish-brown loam about 7 inches thick. The subsurface layer, about 2 inches thick, is neutral, dark-brown to brown loam.

The subsoil is about 9 inches thick and is neutral to mildly alkaline. It is dark-brown to brown clay loam.

The underlying material is calcareous, brown gravelly loam.

These soils have medium available moisture capacity, moderate permeability, and medium internal drainage. Their fertility is moderate. Plant roots readily penetrate to a depth of 5 feet or more.

Typical profile of Hochheim loam, 2 to 6 percent slopes, in an undisturbed area (SW¼SW¼ sec. 8, T. 4 N., R. 19 E., Racine County):

A1—0 to 7 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium, granular structure; very friable; neutral; clear, wavy boundary.

A2—7 to 9 inches, dark-brown to brown (10YR 4/3) loam; weak, medium, platy structure that breaks to weak, fine, granular structure; very friable; neutral; clear, irregular boundary.

B21t—9 to 12 inches, dark-brown to brown (7.5YR 4/4) clay loam; weak, medium, subangular blocky structure that breaks to moderate, fine, subangular blocky structure; firm; dark-brown (7.5YR 3/4–3/2) patchy clay films; neutral; clear, wavy boundary.

B22—12 to 15 inches, dark-brown to brown (7.5YR 4/4) heavy clay loam; moderate to strong, fine, subangular blocky structure; very firm; dark-brown (7.5YR 3/4–3/2), continuous and conspicuous clay films; neutral; clear, wavy lower boundary.

B3—15 to 18 inches, dark-brown (7.5YR 3/4) heavy clay loam; moderate, medium, subangular blocky structure; firm; dark-brown (7.5YR 3/2) continuous clay films; mildly alkaline; clear, wavy boundary.

C—18 to 48 inches +, brown (10YR 5/3) gravelly loam; weak, coarse, subangular blocky structure becoming massive with depth; friable; many dolomitic cobblestones, most of them less than 5 inches in diameter; calcareous.

The neutral to mildly alkaline solum ranges from 12 to 24 inches in thickness, but it is commonly 16 to 20 inches thick. The loess mantle generally is less than 12 inches thick. Most of the solum developed in highly calcareous gravelly loam till. The surface layer of eroded soils ranges to dark grayish brown (10YR 4/2).

The Hochheim soils have a thinner solum (less than 24 inches thick) than the Theresa soils. Hochheim soils are less acid than Miami soils and developed from coarser textured glacial till that is higher in content of carbonates.

Hochheim loam, 2 to 6 percent slopes (HmB).—This soil is on crests of ridges and drumlins. It commonly occurs with other Hochheim soils or with Theresa silt loam. Slopes are convex and generally less than 300 feet in length. This soil has the profile described as typical for the series. Runoff is slow, and the erosion hazard is slight.

Included with this soil in mapping are areas of Hochheim, Theresa, and Miami silt loams. Also included are small areas of moderately eroded Hochheim loam having slopes of 2 to 6 percent.

Gentle slopes slightly limit the use of this soil for crops. (Capability unit IIe–1; recreation group 1; wildlife group 1; urban trees group 5)

Hochheim loam, 6 to 12 percent slopes, eroded (HmC2).—This soil lies on the upper slopes of ridges and

drumlins. Slopes are convex and generally less than 400 feet in length. This soil commonly occurs with gently sloping Hochheim or Theresa soils and with steeper Hochheim soils. As much as two-thirds of the surface layer of this soil has been removed through erosion. The surface layer and subsoil are thinner than those of the profile described as typical for the series. Because some of the subsoil has been mixed into the plow layer, the plow layer is lighter colored than is typical. Erosion is a moderate hazard.

Included in mapping are areas of severely eroded Hochheim loam. Also included are Hochheim soils having a silt loam surface layer.

Slopes and the erosion hazard moderately limit the use of this soil for crops. (Capability unit IIIe–1; recreation group 1; wildlife group 1; urban trees group 5)

Hochheim loam, 12 to 20 percent slopes, eroded (HmD2).—This moderately steep soil occupies side slopes of ridges and drumlins. Slopes are convex and generally less than 300 feet in length. Where gently sloping to sloping Hochheim soils border this soil, overall slope length is 500 feet or more in some places. As much as two-thirds of the surface layer has been lost through erosion. Because part of the subsoil has been mixed into the plow layer, the surface layer is lighter in color than typical. This soil also differs from the soil described as typical for the series because the surface layer and subsoil are considerably thinner and the available moisture capacity is less. Erosion is a severe hazard.

Small areas of other Hochheim loams and silt loams are included with this soil in mapping.

Strong slopes and the resulting erosion hazard severely limit this soil for crop use. (Capability unit IVe–1; recreation group 1; wildlife group 1; urban trees group 5)

Houghton Series

The Houghton series consists of very poorly drained, deep, organic soils that developed from the remains of grasses and sedges. These nearly level soils are on flats and in broad depressions and basins. Most of the Houghton soils in this survey area are west of U. S. Highway 45. The native vegetation was water-tolerant grasses and sedges.

In a typical profile these soils are made up of slightly acid to neutral, black muck that extends to a depth of about 23 inches.

The underlying material, about 25 inches thick, is slightly acid to neutral, very dark brown mucky peat.

These soils have very high available moisture capacity, ponded to very slow surface runoff, moderately rapid permeability, and very slow internal drainage. Roots penetrate to the water table. The fertility in these soils is low.

Typical profile of Houghton muck in an undisturbed area (SW¼NE¼ sec. 22, T. 2 N., R. 20 E., Kenosha County):

1—0 to 9 inches, black (10YR 2/1) muck; weak, medium, subangular blocky structure that breaks to moderate, medium, granular structure; very friable; few discernible plant remains; slightly acid to neutral; clear, wavy boundary.

2—9 to 14 inches, black (N 2/0) muck; weak, medium, platy structure that breaks to moderate, medium, granular structure; very friable; few discernible plant remains; slightly acid to neutral; clear, wavy boundary.

3—14 to 23 inches, black (10YR 2/1) muck; massive in place, breaking to weak, medium, subangular blocky structure; friable; discernible sedge stems and roots that disintegrate when rubbed comprise 20 to 30 percent of the mass; slightly acid to neutral; clear, irregular boundary.

4—23 to 48 inches +, very dark brown (10YR 2/2) mucky peat; massive in place, breaking to weak, medium, granular structure; friable, discernible sedge stems and roots that disintegrate when rubbed comprise 60 to 70 percent of the mass; slightly acid to neutral.

The color of the surface layer ranges to very dark brown (10YR 2/2). Some profiles have layers, up to 10 inches thick, that appear compact and have moderate blocky structure. Discernible plant remains and blocky structure are destroyed in cultivated areas. A small amount of woody material is present in a few places. At depths greater than 42 inches the underlying material is sand, silt, clay, marl, or sedimentary peat. The reaction ranges from medium acid to neutral.

The Houghton soils developed over mucky peat and commonly occur with Ogden, Rollin, Palms, and Adrian soils, which are shallow organic deposits over clay, marl, loam, and sand, respectively.

Houghton muck (0 to 2 percent slopes) (Ht).—This soil occupies depressions that range from 2 to 3 acres to several hundred acres in size.

Included with it in mapping are areas of Ogden, Rollin, Palms, and Adrian soils and a few small areas of Houghton muck that have slopes of 2 to 3 percent. Also included are some areas of very acid peat; one of these areas is located in the southwestern corner of Racine County.

If properly drained, this soil is moderately limited for crop use. Its fertility is low. (Capability unit IIIw–9; recreation group 8; wildlife group 9; urban trees group 9)

Kane Series

In the Kane series are somewhat poorly drained, loamy soils that have a thin silt mantle over outwash sand and gravel. These nearly level to gently sloping soils occupy flats and drainageways of high terraces near the major streams in the survey area. The native vegetation was prairie grasses.

In a typical profile the surface layer is neutral, black loam about 11 inches thick. The subsurface layer, about 3 inches thick, is neutral, very dark brown loam.

The subsoil is about 16 inches thick. The upper part is neutral, dark-brown to brown loam that contains a few mottles of gray and yellowish brown. The middle part is neutral, dark grayish-brown clay loam that has common mottles of grayish brown and yellowish brown. The lower subsoil is calcareous, dark-brown to brown loam that has many mottles of yellowish brown.

The underlying material is calcareous medium sand and gravel.

These soils have medium available moisture capacity, moderate permeability, and slow internal drainage. Their fertility is moderate. Plant roots easily penetrate to the sand and gravel.

Typical profile of Kane loam, 1 to 3 percent slopes, in an undisturbed area (NE¼NW¼ sec. 33, T. 3 N., R. 21 E., Racine County):

A1—0 to 11 inches, black (10YR 2/1) loam; strong, medium, granular structure; friable; neutral; clear, irregular boundary.

A3—11 to 14 inches, very dark brown (10YR 2/2) loam; moderate, medium, granular structure; friable; neutral; clear, irregular boundary.

B1—14 to 21 inches, dark-brown to brown (10YR 4/3) loam; weak, medium, subangular blocky structure that breaks to moderate, fine, subangular blocky structure; friable; few, medium, distinct mottles of gray (10YR 5/1) and yellowish brown (10YR 5/4); neutral; clear, irregular boundary.

B2—21 to 26 inches, dark grayish-brown (10YR 4/2) clay loam; weak, medium, subangular blocky structure that breaks to weak, fine, subangular blocky structure; firm; common, medium, distinct mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/6); neutral; clear, wavy boundary.

B3—26 to 30 inches, dark-brown to brown (10YR 4/3) loam; weak, medium, subangular blocky structure that breaks to weak, medium, granular structure; friable; many, medium, prominent mottles of yellowish brown (10YR 5/8); calcareous; abrupt, wavy boundary.

C—30 to 60 inches, pale-brown (10YR 6/3) medium sand and gravel; single grain; loose; calcareous.

The solum ranges from 24 to 40 inches in thickness and is medium acid to moderately alkaline. Surface layer is loam or silt loam. The part of the subsoil that developed from outwash sand and gravel has a clay loam, loam, or gravelly loam texture. The color of the subsoil is dominantly dark brown or brown (10YR 4/3). The percentage of dolomite gravel in the substratum is high.

The A horizon of the Kane soils is about 14 inches thick and is black to very dark brown. The A horizon of the Matherton soils, in comparison, is about 11 inches thick and is very dark grayish brown to dark grayish brown.

Kane loam, 1 to 3 percent slopes (KoA).—This soil occupies drainageways of high terraces near the major streams in the survey area. It has the profile described as typical for the series. Runoff is slow, and the erosion hazard is slight.

Included in mapping are small areas of Sebewa soils and moderately well drained Warsaw soils. Also included are some areas that have a silt loam surface layer.

If properly drained, this soil has only slight limitations that affect its use for crops. (Capability unit IIw–5; recreation group 5; wildlife group 4; urban trees group 6)

Kane silt loam, clayey substratum, 1 to 3 percent slopes (KhA).—This nearly level to very gently sloping soil lies along drainageways. Its profile is similar to that described as typical for the series, but it has a substratum of clay loam to clay at a depth of 36 inches or more. Runoff is slow and causes a slight hazard of erosion.

Included with this mapping unit are small areas of Kane silt loam and Aztalan silt loam. Some inclusions have a loam surface layer.

If drained, this soil is only slightly limited for crop use. (Capability unit IIw–5; recreation group 5; wildlife group 4; urban trees group 6)

Knowles Series

The Knowles series consists of loamy, well-drained soils developed in a thin silt mantle over limestone bedrock. These gently sloping to sloping soils commonly occur on ridges. The native vegetation was hardwood forest.

In a typical profile the surface layer is neutral, dark grayish-brown silt loam about 7 inches thick.

The subsoil is about 17 inches thick and is mildly alkaline. The upper part is dark-brown to brown silt loam. The middle part is dark-brown silty clay loam. The lower subsoil is dark-brown to brown clay loam. Dolomitic limestone bedrock is at a depth of 24 inches.

These soils have medium available moisture capacity, moderate permeability, and medium internal drainage. The tilth of these soils is good, and their fertility is moderate. Roots penetrate to the bedrock.

Typical profile of Knowles silt loam, 2 to 6 percent slopes, in a cultivated area (SW¼SW¼ sec. 27, T. 4 N., R. 19 E., Racine County):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; very friable; neutral; abrupt, smooth boundary.

B1—7 to 12 inches, dark-brown to brown (10YR 4/3) silt loam; moderate, medium, subangular blocky structure; firm; mildly alkaline; clear, smooth boundary.

B21t—12 to 16 inches, dark-brown (10YR 4/3) silty clay loam; moderate, medium, subangular blocky structure; some light-gray (10YR 7/2) coatings; mildly alkaline; clear, smooth boundary.

IIB22t—16 to 24 inches, dark-brown to brown (7.5YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm; mildly alkaline; abrupt, smooth boundary.

IIIR—24 inches +, dolomitic limestone bedrock.

In undisturbed areas, the surface layer is generally less than 6 inches thick and is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The depth to the limestone bedrock ranges from 20 to 30 inches.

The Warsaw, Miami, and Ringwood soils developed in silt over outwash or glacial till material, whereas the Knowles soils developed in silt over bedrock.

Knowles silt loam, 2 to 6 percent slopes (KmB).—This soil occupies ridges, where runoff is medium. Limestone bedrock is typically at a depth of 24 inches, but the depth to limestone ranges from 20 to 30 inches. Also included with this soil in mapping are moderately eroded areas, areas having slopes of as much as 9 or 10 percent, and, on the lesser slopes, areas that have mottling in the lower subsoil.

Because of slopes and the resulting erosion hazard, this soil is slightly limited for crop use. (Capability unit IIe–2; recreation group 2; wildlife group 1; urban trees group 1)

Lawson Series, Calcareous Variant

The Lawson series, calcareous variant, consists of somewhat poorly drained soils that developed from recent deposits of loamy alluvium. These nearly level soils lie on bottoms along the Root and Fox Rivers. The native vegetation was water-tolerant grasses.

In a typical profile the surface layer and the material underlying it are calcareous. The surface layer is very dark brown silt loam about 10 inches thick. It is underlain by about 15 inches of very dark grayish-brown to very dark brown silt loam. The next layer, about 12 inches thick, is dark-brown silty clay loam that has a few mottles of dark yellowish brown.

The upper part of the underlying material is dark-brown to brown silty clay loam about 11 inches thick. It has common dark yellowish-brown and yellowish-brown mottles. The next layer, about 7 inches thick, is brown heavy sandy loam that has many mottles of gray, dark-yellowish brown, and yellowish brown. It is underlain by grayish-brown loamy sand that has common gray, brown, and strong-brown mottles.

These soils have very high available moisture capacity, moderate permeability, and slow internal drainage. The tilth of these soils is good, and fertility is high. Roots penetrate to the water table, which, seasonally, is less than 3 feet from the soil surface.

Typical profile of Lawson silt loam, calcareous variant, in an undisturbed area (NW¼NW¼ sec. 30, T. 4 N., R. 23 E., Racine County):

A11—0 to 10 inches, very dark brown (10YR 2/2) silt loam; weak to moderate, medium, subangular blocky structure; friable; calcareous (weak effervescence with hydrochloric acid); clear, wavy boundary.

A12—10 to 25 inches, very dark grayish-brown (10YR 3/2) to very dark brown (10YR 2/2) silt loam; moderate, medium and fine, subangular blocky structure; friable; calcareous (weak effervescence with hydrochloric acid); clear, wavy boundary.

A13—25 to 37 inches, dark-brown (10YR 3/3) silty clay loam; moderate, fine, subangular blocky structure; firm; few, fine, faint mottles of dark yellowish brown (10YR 4/4); calcareous (effervescence with hydrochloric acid); clear, wavy boundary.

C1—37 to 48 inches, dark-brown to brown (10YR 4/3–5/3) silty clay loam; moderate, medium, subangular blocky structure; sticky when wet; common, medium, distinct mottles of gray (10YR 5/1), dark yellowish brown (10YR 4/4), and yellowish brown (10YR 5/6); highly calcareous; clear, wavy boundary.

C2—48 to 55 inches, brown (10YR 5/3) heavy sandy loam; weak, medium, subangular blocky structure; nonsticky when wet; many, medium, distinct mottles of gray (10YR 5/1), dark yellowish brown (10YR 4/4), and yellowish brown (10YR 5/6); calcareous; clear, wavy boundary.

C3—55 to 60 inches +, grayish-brown (10YR 5/2) loamy sand; single grain; nonsticky when wet; common, medium, distinct mottles of gray (N 5/0), dark brown to brown (7.5YR 4/4), and strong brown (7.5YR 5/6); calcareous.

The thickness of the A horizon ranges from 20 to 40 inches. Stratified sandy layers are at a depth of 40 to 60 inches or more.

Lawson soils, calcareous variant, have a narrower range in texture throughout the profile than is typical of Alluvial land.

Lawson silt loam, calcareous variant (0 to 2 percent slopes) (Lp).—This soil occupies alluvial bottoms along major streams in the survey area. Surface runoff is slow. Included in mapping are small areas of Alluvial land, Wet alluvial land, and Dorchester and Sawmill soils.

If this Lawson soil is protected from overflow, its use for crops is only slightly limited. (Capability unit IIw–13; recreation group 7; wildlife group 8; urban trees group 7)

Loamy land (Lu) consists of filled and leveled areas where the fill is mainly a mixture of soil materials. The fill includes sandy to clayey underlying material and, in some places, cinders, broken concrete, and industrial waste. Many shopping centers, storage warehouses, and industrial sites, in or near the cities of Kenosha and Racine, are located on this land type.

The limitations that affect use of Loamy land cannot be given, because of the variety of materials constituting this land type. (Capability unit VIIIs–10; recreation group 9; wildlife group 10; urban trees group 10)

Lorenzo Series

The Lorenzo series is made up of well-drained, loamy soils that are underlain by outwash sand and gravel. These soils occupy terraces and morainic ridges. They are mainly in the vicinity of the major streams in the survey area. The native vegetation was prairie grasses.

In a typical profile the surface layer is neutral, very dark gray loam about 6 inches thick. The subsurface layer, about 4 inches thick, is neutral, dark-brown gritty silt loam.

The subsoil is about 9 inches thick. The upper part is neutral, dark-brown to brown sandy clay loam. The lower part is neutral, dark-brown to brown heavy loam.

The underlying material is calcareous, yellowish-brown sand and gravel.

These soils have rapid internal drainage and moderate permeability. They have a medium available moisture capacity and low fertility. Roots easily penetrate to the sand and gravel underlying material.

Typical profile of Lorenzo loam, 2 to 6 percent slopes, in a cultivated area (SE¼SE¼ sec. 1, T. 1 N., R. 20 E., Kenosha County):

Ap—0 to 6 inches, very dark gray (10YR 3/1) loam; weak, medium, granular structure; very friable; neutral; abrupt, smooth boundary.

A3—6 to 10 inches, dark-brown (7.5YR 3/2) gritty silt loam; moderate, medium, granular structure; friable; neutral; clear, smooth boundary.

B2t—10 to 16 inches, brown (7.5YR 4/3) sandy clay loam; moderate, medium, subangular blocky structure; friable; neutral; clear, smooth boundary.

B3—16 to 19 inches, brown (7.5YR 4/2) heavy loam; weak, medium, subangular blocky structure; friable; neutral; clear, smooth boundary.

C—19 to 60 inches, yellowish-brown (10YR 5/4) medium, coarse sand and gravel; single grain; loose; highly calcareous.

The solum is neutral to slightly acid. It ranges from 12 to 24 inches in thickness, but it is generally 16 to 20 inches thick. The texture of the surface layer is silt loam or loam. Undisturbed areas have a black (10YR 2/1) or very dark brown (10YR 2/2) surface layer. The subsoil ranges from clay loam to gravelly loam and is mainly dark brown to brown (7.5YR 4/3). Gravel in the underlying material is largely dolomite.

The Ap layer of the Lorenzo and Casco soils is about 6 inches thick. The color of this layer in the Lorenzo soils is very dark gray, whereas it is dark brown to brown in the Casco soils.

Lorenzo loam, 2 to 6 percent slopes (LyB).—This soil lies on terraces in the vicinity of the major streams in the survey area. Included with this soil in mapping are small areas that are moderately eroded, small areas having a silt loam surface layer, and small areas of Warsaw loam and of Casco loam.

The medium surface runoff, medium available moisture capacity, and low fertility are moderate limitations that affect use of this soil for crops. (Capability unit IIIe–4; recreation group 2; wildlife group 3; urban trees group 1)

Markham Series

The Markham series is made up of well-drained or moderately well drained soils that developed in a thin silt mantle and the underlying clay loam or silty clay loam glacial till. These gently sloping to sloping soils occur on ridges and knobs. The native vegetation consisted of prairie grasses and sparse hardwoods.

In a typical profile the surface layer is mildly alkaline, very dark gray silt loam about 8 inches thick. The subsurface layer, about 2 inches thick, is neutral, dark grayish-brown silt loam.

The subsoil is 18 inches thick. The upper part is neutral to slightly acid, dark-brown to brown silty clay loam to silty clay. The lower part is neutral, dark-brown to brown silty clay that has a few mottles of yellowish brown.

The underlying material is calcareous, brown clay loam marked with common yellowish-brown mottles.

These soils have high available moisture capacity, moderately slow permeability, and medium internal drainage. The tilth of these soils is good, and their fertility is high. Roots penetrate to a depth of 5 feet or more.

Typical profile of Markham silt loam, 2 to 6 percent slopes, in an undisturbed area (NW¼NE¼ sec. 25, T. 3 N., R. 20 E., Racine County):

A1—0 to 8 inches, very dark gray (10YR 3/1) silt loam; moderate, fine, subangular blocky structure that breaks to moderate to strong, fine, granular structure; very friable; mildly alkaline; clear, irregular boundary.

A2—8 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; very friable; neutral; clear, irregular boundary.

B1t—10 to 13 inches, dark-brown to brown (10YR 4/3) silty clay loam; moderate, fine and medium, subangular blocky structure; firm; some worm casts and holes; grayish-brown granular coatings on ped faces; neutral; clear, wavy boundary.

B21t—13 to 17 inches, dark-brown to brown (10YR 4/3) silty clay; moderate, fine, subangular blocky structure; very firm; continuous clay films; neutral to slightly acid; gradual, wavy boundary.

IIB22t—17 to 23 inches, dark-brown to brown (10YR 4/3) silty clay; moderate, fine, subangular blocky structure; very firm; continuous clay films; some weathered dolomitic fragments; very dark grayish-brown (10YR 3/2) organic stains on ped faces; neutral to slightly acid; clear, irregular boundary.

IIB3t—23 to 28 inches, dark-brown to brown (10YR 4/3) silty clay; moderate, medium to coarse, subangular blocky structure; firm; continuous clay films; very dark grayish-brown (10YR 3/2) organic stains cover most ped faces; few, fine, distinct mottles of yellowish brown (10YR 5/4); neutral; abrupt, irregular boundary.

IIC—28 to 48 inches +, brown (10YR 5/3) clay loam; weak, medium, subangular blocky structure becoming massive with depth; firm; common, medium, distinct mottles of yellowish brown (10YR 5/4–5/6); streaks of light-gray (10YR 7/1) soft lime concretions; very highly calcareous.

In cultivated areas the color of the surface layer ranges from very dark gray (10YR 3/1) to dark brown (10YR 4/3). The solum ranges from 24 to 36 inches in thickness. The silt mantle is 10 to 20 inches thick. Where the Markham soils are gently sloping, a few, fine, faint mottles of yellowish brown (10YR 5/6) appear in the lower solum. The texture of the underlying material ranges from clay loam to silty clay.

The Markham soils have an 8-inch surface layer, as do the Morley soils. The surface layer of the Markham soils is very dark gray, however, and that of the Morley soils is dark grayish brown. The surface layer of the Markham soils is not so deep as that of the Varna soils.

Markham silt loam, 2 to 6 percent slopes (MeB).—This soil is on ridges and knobs. It has the profile described as typical for the series. Slopes are convex and generally less than 400 feet in length. The soil occurs with the somewhat poorly drained Elliott soils and the poorly drained Ashkum soils, which occupy adjacent lower slopes and drainageways. Runoff is slow, and the erosion hazard is slight.

Included with this soil in mapping are areas of Elliott silty clay loam, Morley silt loam, Varna silt loam, and moderately eroded Markham silt loam.

The gentle slopes slightly limit this soil for crop use. (Capability unit IIe–6; recreation group 3; wildlife group 3; urban trees group 2)

Markham silt loam, 2 to 6 percent slopes, eroded (MeB2).—As much as two-thirds of the original surface layer of this soil has been removed through erosion. The present surface layer is lighter colored and thinner than that described as typical for the series. This soil is on ridges and knobs and occurs with the somewhat poorly drained Elliott soils, the poorly drained Ashkum soils, and other Markham soils. Slopes are convex and generally less than 300 feet in length. Medium runoff causes a moderate hazard of erosion.

Included in mapping are small areas of Morley silt loam and slightly eroded Markham silt loam.

Because of slope, the use of this soil for crops is slightly limited. The soil is in poorer tilth and is less productive than less eroded Markham soils. If tilled when wet, this soil dries into hard lumps and clods. (Capability unit IIe–6; recreation group 3; wildlife group 3; urban trees group 2)

Markham silt loam, 6 to 12 percent slopes, eroded (MeC2).—This soil differs from the soil described as typical for the series in having a thinner and lighter colored surface layer and a thinner subsoil. This sloping soil occupies ridges and knobs. Slopes are convex and generally less than 300 feet in length. The soil occurs with the somewhat poorly drained Elliott soils and the poorly drained Ashkum soils, which occupy adjacent lower slopes and drainageways, and with other Markham soils. Runoff is medium, and the erosion hazard is moderate.

Included in mapping are small areas of Morley silt loam, Varna silt loam, and slightly eroded Markham silt loam.

Slopes and the erosion hazard are moderate limitations that affect use of this soil for crops. The loss of surface soil results in less favorable tilth and lower productivity than on less eroded Markham soils. If tilled when wet, this soil tends to dry in hard lumps and clods. (Capability unit IIIe–6; recreation group 3; wildlife group 3; urban trees group 2)

Marsh (Mf) is adjacent to lakes, ponds, and major streams in the survey area. The largest acreage is along the Fox River in the northwestern part of the area. Most of this land is covered by floodwater in spring or following periods of heavy rainfall. Vegetation is rushes, sedges, cattails, and other water-tolerant plants.

Because of wetness, high water table, and overflow hazard, the use of Marsh for crops is very severely limited. (Capability unit VIIIw–15; recreation group 9; wildlife group 10; urban trees group 10)

Martinton Series

In the Martinton series are somewhat poorly drained soils that developed from laminated lacustrine silty clay loam, silty clay, and clay. These nearly level and gently sloping soils occupy flats, depressions, and drainageways. The native vegetation consisted of prairie grasses.

In a typical profile the surface layer is neutral, black silt loam about 12 inches thick.

The subsoil is about 22 inches thick. The upper part is neutral, dark yellowish-brown silty clay loam containing a few mottles of gray and grayish brown. This is underlain by mildly alkaline, olive-brown silty clay loam and silty clay marked with common brown mottles. The lower part is mildly alkaline, dark-brown to brown silty clay loam that contains many brown mottles.

The underlying material is calcareous, light yellowish-brown laminated silty clay loam and silty clay marked with common brown mottles.

These soils have high available moisture capacity, slow permeability, and slow internal drainage. The tilth of these soils is good, and their fertility is high. Roots penetrate to the water table. Seasonally, the water table is less than 3 feet below the soil surface.

Typical profile of Martinton silt loam, 1 to 3 percent slopes, in a cultivated field (SW¼NE¼ sec. 11, T. 3 N., R. 20 E., Racine County):

Ap—0 to 8 inches, black (10YR 2/1) silt loam; weak, fine, granular structure; very friable; neutral; clear, smooth boundary.

A3—8 to 12 inches, black (10YR 2/1) silt loam; weak, medium, granular structure; friable; neutral; clear, smooth boundary.

B1t—12 to 18 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; few, medium, distinct mottles of gray (10YR 5/1) and grayish brown (10YR 5/2); black (10YR 2/1) organic stains on peds; neutral; clear, smooth boundary.

B21t—18 to 24 inches, olive-brown (2.5Y 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; common, medium, distinct mottles of brown (7.5YR 5/2–5/4); black (10YR 2/1) organic stains on peds; mildly alkaline; clear, smooth boundary.

B22t—24 to 30 inches, olive-brown (2.5Y 4/4) silty clay; moderate, medium, subangular blocky structure; very firm; common, medium, distinct mottles of brown (7.5YR 5/2–5/4); patchy clay films on peds; black (10YR 2/1) organic stains on peds; mildly alkaline; clear, smooth boundary.

B3—30 to 34 inches, dark-brown to brown (10YR 4/3) silty clay loam; moderate, medium, subangular blocky structure; firm; many, medium, distinct mottles of brown (7.5YR 5/2–5/4); mildly alkaline; clear, smooth boundary.

C—34 to 48 inches, light yellowish-brown (10YR 6/4) laminated silty clay loam and silty clay; massive; very firm; common, medium, distinct mottles of brown (7.5YR 5/2–5/4); light-gray (10YR 7/1) free lime; highly calcareous.

The surface layer is dominantly silt loam, but a loam surface layer occurs where the lacustrine sediments are overlain by a thin layer of outwash. The texture of the subsoil is clay loam to clay. The depth to the underlying material ranges from 24 to 36 inches. This material is mainly laminated silt and clay, but in some areas layers of loamy and sandy material are at a depth of 40 inches or more.

The Martinton soils resemble the Mundelein soils in their somewhat poor drainage and brown colors, but they developed from clayey sediments rather than from silt and fine sand.

Martinton silt loam, 1 to 3 percent slopes (MgA).—This soil occurs in depressions and along drainageways. Runoff is slow, and the hazard of erosion is slight. Included with this soil in mapping are small areas of Saylesville silt loam, dark surface variant, and Montgomery soils having a silty clay loam surface layer.

If properly drained, this soil is slightly limited for crop use. (Capability unit IIw–2; recreation group 5; wildlife group 4; urban trees group 6)

Matherton Series

The Matherton series consists of somewhat poorly drained, loamy soils that are underlain by outwash sand and gravel. These nearly level to gently sloping soils occupy flats and drainageways of high terraces, mainly in the vicinity of the major streams in the survey area. The native vegetation was sparse hardwoods and prairie grasses.

In a typical profile the surface layer is slightly acid to neutral, very dark grayish-brown loam about 9 inches thick. The subsurface layer, about 2 inches thick, is slightly acid, dark grayish-brown loam.

The subsoil is about 19 inches thick. The upper part is medium acid, dark grayish-brown silty clay loam that contains a few mottles of yellowish brown. The middle part is medium acid, dark-brown to brown clay loam marked with common gray, grayish-brown, and yellowish-brown mottles. The lower subsoil is neutral, pale-brown sandy clay loam that has mottles of gray, grayish brown, and yellowish brown.

The underlying material is calcareous, light brownish-gray, stratified sand and gravel that contain common mottles of grayish brown and yellowish brown.

These soils have slow internal drainage, moderate permeability, and medium available moisture capacity. Their fertility is moderate. Plant roots readily penetrate to the water table or to the stratified sand and gravel.

Typical profile of Matherton loam, 1 to 3 percent slopes, in a cultivated area (SW¼SE¼ sec. 10, T. 2 N., R. 19 E., Racine County):

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) loam; weak, fine, granular structure; friable; slightly acid to neutral; abrupt, wavy boundary.

A2—9 to 11 inches, dark grayish-brown (10YR 4/2) loam; weak, medium, platy structure that breaks to weak, fine, granular structure; friable; slightly acid; clear, irregular boundary.

B1t—11 to 18 inches, dark grayish-brown (10YR 4/2) silty clay loam; moderate, fine and medium, subangular blocky structure; firm; few, medium, distinct mottles of yellowish brown (10YR 5/8); medium acid; clear, irregular boundary.

IIB2t—18 to 23 inches, dark-brown to brown (10YR 4/3) clay loam; moderate, medium, subangular blocky structure; firm; common, medium, distinct mottles of gray (10YR 6/1), grayish brown (10YR 5/2), and yellowish brown (10YR 5/8); dark-brown (10YR 3/3) clay films; medium acid; clear, irregular boundary.

IIB3t—23 to 30 inches, pale-brown (10YR 6/3) sandy clay loam; moderate, coarse, subangular blocky structure; firm; common, coarse, distinct mottles of light gray (10YR 6/1), grayish brown (10YR 5/2), and yellowish brown (10YR 5/8); neutral; gradual, irregular boundary.

IIC—30 to 60 inches +, light brownish-gray (10YR 6/2) stratified sand and gravel; single grain; loose; loamy bands less than 1 inch thick at various depths; common, coarse, distinct mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/8); calcareous.

The solum ranges from 24 to 40 inches in thickness and is medium acid to neutral. In some places the silt mantle is as much as 20 inches thick. The part of the subsoil that developed from silt has a heavy silt loam to silty clay loam texture. Horizons in the subsoil that developed from sand and gravel have a clay loam to gravelly loam texture. Gravel in the underlying material is largely dolomite.

The Ap layer of the Matherton soils is about 9 inches thick and very dark grayish brown. The Ap layer in the Fox soils, in comparison, is about 7 inches thick and dark grayish brown.

Matherton loam, 1 to 3 percent slopes (MkA).—This soil occupies depressions and drainageways on high terraces in the vicinity of the major streams in the survey area. This soil has the profile described as typical for the series. The loam surface layer feels gritty when rubbed between the fingers. Runoff is slow, and the hazard of erosion is slight.

Included with this soil in mapping are small areas of Dresden loam and Sebewa silt loam. Also included are some areas that have a silt loam or a sandy loam surface layer.

If properly drained, this soil is slightly limited for crop use. (Capability unit IIw–5; recreation group 5; wildlife group 2; urban trees group 6)

Matherton loam, clayey substratum, 1 to 3 percent slopes (MlA).—This soil is along drainageways. It differs from the soil described as typical for the series because clay loam to clay underlying material occurs at a depth of 36 to 60 inches. Runoff is slow, and the erosion hazard is slight.

Included with this soil in mapping are small areas of Aztalan loam. Also included are areas that have a silt loam surface layer.

If properly drained, this soil is slightly limited for crop use. (Capability unit IIw–5; recreation group 5; wildlife group 2; urban trees group 6)

McHenry Series

The McHenry series is made up of well-drained soils that developed in a thin silt mantle and the underlying sandy loam glacial till. These gently sloping to sloping soils lie on ridges and knobs. The native vegetation was hardwood forest.

In a typical profile the surface layer is mildly alkaline, very dark brown to very dark grayish-brown silt loam about 4 inches thick. The subsurface layer, about 5 inches thick, is mildly alkaline, dark grayish-brown silt loam.

The subsoil is about 23 inches thick. The upper part is neutral, dark-brown to brown silt loam. It is underlain by neutral, dark yellowish-brown silty clay loam. The lower subsoil is neutral to mildly alkaline, dark-brown to brown clay loam to sandy clay loam.

The underlying material is calcareous, brown sandy loam.

These soils have medium available moisture capacity, moderate permeability, and medium internal drainage. The tilth of these soils is good, and their fertility is moderate. Roots readily penetrate to a depth of 5 feet or more.

Typical profile of McHenry silt loam, 2 to 6 percent slopes, in an undisturbed area (SW¼SE¼ sec. 30, T. 4 N., R. 19 E., Racine County):

A1—0 to 4 inches, very dark brown (10YR 2/2) to very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; very friable; mildly alkaline; clear, irregular boundary.

A2—4 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, platy structure that breaks to moderate, medium, granular structure; very friable; worm casts; some mixing of material from A2 and B1 horizons by earthworms; mildly alkaline; clear, irregular boundary.

B1—9 to 13 inches, dark-brown to brown (10YR 4/3) silt loam; weak, medium, subangular blocky structure that breaks to weak, fine, subangular blocky structure; friable; few worm casts; neutral; clear, irregular boundary.

B21t—13 to 18 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; patchy clay films; neutral; clear, irregular boundary.

IIB22t—18 to 25 inches, dark-brown to brown (7.5YR 4/4) clay loam; moderate, medium, subangular blocky structure that breaks to moderate to strong, fine, angular blocky structure; very firm; dark-brown (7.5YR 3/2) complete clay films; some pebbles, most of them less than 10 millimeters in diameter; neutral; clear, irregular boundary.

IIB3t—25 to 32 inches, dark-brown to brown (7.5YR 4/4) sandy clay loam; moderate, coarse, subangular blocky structure that breaks to moderate to strong, medium, angular blocky structure; very firm; dark-brown (7.5YR 3/2) complete clay films; numerous pebbles, most of them less than 10 millimeters in diameter; mildly alkaline; abrupt, irregular boundary.

IIC—32 to 48 inches +, brown (10YR 5/3) sandy loam till; single grain; loose; calcareous.

The thickness of the solum ranges from 24 to 36 inches. The thickness of the silt mantle ranges from 12 to 24 inches; therefore, part or most of the subsoil developed from glacial till. In cultivated areas there is a 6- to 9-inch surface layer that varies from dark brown (10YR 3/3) to brown (10YR 5/3). In places the underlying material includes layers of water-sorted sand and gravel. The texture of the lower subsoil ranges from clay loam to sandy clay loam.

McHenry soils have a neutral to mildly alkaline solum, whereas the Miami soils have a medium acid to mildly alkaline solum. The McHenry soils are underlain by sandy loam till; the Miami soils are underlain by loam till.

McHenry silt loam, 2 to 6 percent slopes (MpB).—This soil occurs on ridges and knobs. Slopes are convex and generally less than 400 feet in length. This soil has the profile described as typical for the series. Runoff is slow, and the erosion hazard is slight.

Included in mapping are nearly level areas, moderately eroded spots that have loam underlying material, and areas that show mottles in the lower solum. Also included are small areas where most of the subsoil formed in a silt mantle.

Because of slopes, this soil is slightly limited for crop use. Capability unit IIe–1; recreation group 1; wildlife group 1; urban trees group 1)

McHenry silt loam, 6 to 12 percent slopes, eroded (MpC2).—This soil is on ridges and knobs. Slopes are convex and generally less than 400 feet in length. This soil has a thinner and lighter colored surface layer and a thinner subsoil than the soil described as typical for the series. Runoff is medium, and the erosion hazard is moderate.

Included in mapping are slightly eroded areas and small areas of Miami silt loam.

Slopes moderately limit this soil for crop use. (Capability unit IIIe–1; recreation group 1; wildlife group 1; urban trees group 1)

Miami Series

In the Miami series are well-drained soils that developed in a thin silt mantle and the underlying loamy glacial till. These gently sloping to moderately steep soils occupy low ridges and knobs and commonly occur with the McHenry soils. The native vegetation was hardwood forest.

In a typical profile the surface layer is medium acid, very dark gray silt loam about 4 inches thick. The subsurface layer, about 5 inches thick, is slightly acid, dark grayish-brown to grayish-brown silt loam.

The dark-brown to brown subsoil is about 18 inches thick. The upper part is medium acid silty clay loam. It is underlain by medium acid clay loam. The lower subsoil is mildly alkaline heavy loam.

The underlying material is highly calcareous, yellowish-brown light loam.

These soils have medium available moisture capacity, moderate permeability, and medium internal drainage. They are in good tilth, and roots readily penetrate to a depth of 5 feet or more. The fertility in these soils is moderate.

Typical profile of Miami silt loam, 2 to 6 percent slopes, in an undisturbed area (SW¼SW¼ sec. 35, T. 1 N., R. 19 E., Kenosha County):

A1—0 to 4 inches, very dark gray (10YR 3/1) silt loam; moderate, medium, granular structure; very friable; medium acid; clear, irregular boundary.

A2—4 to 9 inches, dark grayish-brown to grayish-brown (10YR 4/2–5/2) silt loam; weak, medium, platy structure that breaks to weak to moderate, medium, granular structure; very friable; slightly acid; clear, irregular boundary.

B1t—9 to 12 inches, dark-brown to brown (10YR 4/3) silty clay loam; weak to moderate, very fine, subangular blocky structure; friable; medium acid; clear, irregular boundary.

IIB21t—12 to 18 inches, dark-brown to brown (7.5YR 4/4) clay loam; moderate, fine, subangular blocky structure; firm; partial clay films; pebbles to 25 millimeters in diameter, most of them less than 10 millimeters; medium acid; clear, irregular boundary.

IIB22t—18 to 23 inches, dark-brown to brown (7.5YR 4/4) clay loam; moderate, medium, subangular blocky structure that breaks to moderate to strong, fine, angular blocky structure; firm; dark-brown (7.5YR 3/2) clay films on most ped faces; pebbles as much as 25 millimeters in diameter, but most of them less than 10 millimeters; medium acid; clear, irregular boundary.

IIB3—23 to 27 inches, dark-brown to brown (7.5YR 4/4) heavy loam; moderately weak, medium to fine, subangular blocky structure; firm; dark-brown (7.5YR 3/4) partial clay films; numerous pebbles, most of them less than 10 millimeters in diameter; mildly alkaline; clear, irregular boundary.

IIC—27 to 48 inches +, yellowish-brown (10YR 5/4) light loam; massive; very friable; high percent of sand; highly calcareous.

The solum generally ranges from 24 to 36 inches in thickness, but in some places it is 42 inches thick (fig. 5). The silt mantle is 0 to 18 inches thick; consequently, most of the subsoil developed in glacial till. Cultivated areas have a dark grayish-brown (10YR 4/2) or brown (10YR 5/3) surface layer. The substratum ranges from loam to heavy sandy loam in texture and in some places is brown (7.5YR 5/4).

The Miami soils differ from the McHenry soils in being more acid in the solum. The underlying material of the Miami soils is loam to heavy sandy loam, whereas that of the McHenry soils is sandy loam.

Miami loam, 2 to 6 percent slopes (MwB).—This soil occurs on low ridges and knobs. Slopes are convex and generally less than 400 feet in length. The surface layer of this soil is slightly coarser textured than that described as typical for the series and feels gritty when rubbed between the fingers. Included with this soil in mapping are moderately eroded areas. Also included are

Figure 5.—Profile of a Miami silt loam.

areas of Miami silt loam and Miami loam, sandy loam substratum.

The use of this soil for crops is slightly limited by the slope. (Capability unit IIe–1; recreation group 1; wildlife group 1; urban trees group 1)

Miami loam, 6 to 12 percent slopes, eroded (MwC2).—This soil lies on ridges and knobs. Slopes are convex and generally less than 300 feet in length. The profile of this soil differs from that described as typical for the series because the surface layer is lighter colored, slightly coarser textured, and thinner. The surface layer feels gritty when rubbed between the fingers. The surface layer and subsoil also are thinner than typical. As much as two-thirds of the surface layer has been removed through erosion. Included with this soil in mapping are small areas that are slightly eroded. Also included are small areas of Miami silt loam, eroded, and Miami loam, sandy loam substratum, eroded.

Slopes moderately limit the use of this soil for crops. (Capability unit IIIe–1; recreation group 1; wildlife group 1; urban trees group 1)

Miami loam, 12 to 20 percent slopes, eroded (MwD2).—This soil occurs on ridges and knobs. Slopes are convex and generally less than 300 feet in length. This soil has a lighter colored, slightly coarser textured, and thinner surface layer than that described as typical for the series. The loam surface layer feels gritty when rubbed between the fingers. The subsoil also is thinner than for the typical soil. As much as two-thirds of the surface layer of this soil has been removed through erosion. Included in mapping are areas of Miami loam, sandy loam substratum, eroded. Also included are some small areas that are slightly eroded or that have a silt loam surface layer.

The strong slope and resulting erosion hazard severely limit use of this soil for crops. (Capability unit IVe–1; recreation group 1; wildlife group 1; urban trees group 1)

Miami loam, sandy loam substratum, 2 to 6 percent slopes (MxB).—This soil occupies ridges and knobs. Its profile differs from that described as typical for the series in having a somewhat lighter textured lower subsoil and sandy loam rather than light loam underlying material. Included in mapping are small areas of Miami loam, Fox loam, and Casco loam. Also included are areas that have a sandy loam or a sandy clay loam subsoil. Some inclusions have a sandy loam surface layer or are moderately eroded.

Gentle slopes slightly limit this soil for crop use. (Capability unit IIe–1; recreation group 2; wildlife group 1; urban trees group 1)

Miami loam, sandy loam substratum, 6 to 12 percent slopes, eroded (MxC2).—As much as two-thirds of the original surface layer of this soil has been removed through erosion. Areas occur on ridges and knobs. This soil differs from the soil described as typical for the series because it has a thinner surface layer and subsoil, a lighter textured lower subsoil, and sandy loam rather than light loam underlying material. The surface layer also is lighter colored than for the typical soil. Included in mapping are small areas of Miami loam, Fox loam, and Casco loam. Also included are some areas having a sandy clay loam or sandy loam subsoil.

The slope moderately limits use of this soil for crops. (Capability unit IIIe–1; recreation group 2; wildlife group 1; urban trees group 1)

Miami loam, sandy loam substratum, 12 to 20 percent slopes, eroded (MxD2).—This soil occupies ridges and knobs. It has a thinner surface layer and subsoil than the soil described as typical for the series. It also differs from the typical soil in having a lighter colored surface layer and sandy loam rather than light loam underlying material. As much as two-thirds of the original surface layer has been removed through erosion. Included in mapping are small areas of Miami loam, Fox loam, and Casco loam soils. Some slightly eroded areas are also included.

Strong slopes and the resulting erosion hazard severely limit the use of this soil for crops. (Capability unit IVe–1; recreation group 2; wildlife group 1; urban trees group 1)

Miami silt loam, 2 to 6 percent slopes (MyB).—This soil occurs on low ridges and knobs. Slopes are convex and generally less than 400 feet in length. This soil has the profile described as typical for the series. Included with this soil in mapping are moderately eroded areas, small nearly level areas, and areas that have mottling in the lower solum. Also included are small areas of McHenry silt loam and Miami loam.

Because of gentle slopes, this soil is slightly limited for crop use. (Capability unit IIe–1; recreation group 1; wildlife group 1; urban trees group 1)

Miami silt loam, 6 to 12 percent slopes, eroded (MyC2).—This soil is similar to the soil described as typical for the series except that the depth to unweathered glacial till is slightly less because part of the surface layer has been lost through erosion. Small areas of McHenry soils are included in mapping.

The erosion hazard is a moderate limitation that affects use of this soil for crops. (Capability unit IIIe–1; recreation group 1; wildlife group 1; urban trees group 1)

Montgomery Series

The Montgomery series consists of poorly drained soils that developed from laminated lacustrine silty clay loam, silty clay, and clay. These nearly level soils occupy flats, depressions, and drainageways. The native vegetation consisted of water-tolerant grasses and shrubs.

In a typical profile the surface layer is neutral, black silty clay about 8 inches thick. The subsurface layer, about 8 inches thick, is neutral, very dark gray and gray silty clay that is marked with many mottles of dark yellowish brown, yellowish brown, and gray to light gray.

The subsoil is about 20 inches thick. The upper part is neutral, gray silty clay that contains many mottles of dark yellowish brown and yellowish brown. The lower part is moderately alkaline, gray light silty clay marked with many yellowish-brown and brownish-yellow mottles.

The underlying material is highly calcareous, grayish-brown to light olive-brown and light brownish-gray heavy silty clay loam. It contains many yellowish-brown mottles.

These soils have high available moisture capacity, ponded to very slow surface runoff, slow permeability, and very slow internal drainage. Their tilth is poor. If cultivated or pastured when wet, these soils tend to puddle and dry to hard clods. Roots penetrate to the water table, which, seasonally, is less than 1 foot below the soil surface. The fertility in these soils is high.

Typical profile of Montgomery silty clay in a cultivated field (SE¼NE¼ sec. 14, T. 2 N., R. 19 E., Racine County):

Ap—0 to 8 inches, black (N 2/0) silty clay; moderate, fine, subangular blocky structure that breaks to moderate, medium, granular structure; slightly hard when dry, slightly plastic when wet; neutral; abrupt, smooth boundary.

A1—8 to 11 inches, very dark gray (N 3/0) silty clay; weak, thick, platy structure that breaks to moderate, very fine, subangular blocky structure; slightly hard when dry, slightly plastic when wet; many, fine, distinct mottles of dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/6), and gray to light gray (10YR 6/1); neutral; clear, wavy boundary.

A3g—11 to 16 inches, gray (N 5/0) silty clay; moderate, very fine, subangular blocky structure; slightly hard when dry, slightly plastic when wet; many, fine, distinct mottles of dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/6), and gray to light gray (10YR 6/1); neutral; gradual, wavy boundary.

B21g—16 to 22 inches, gray (N 5/0) silty clay; weak, thick, prismatic structure that breaks to moderate, medium, angular blocky structure; hard when dry, plastic when wet; many, fine, distinct mottles of dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6–5/8); patchy clay films on peds; gray (5Y 5/1) organic stains; neutral; clear, wavy boundary.

B22g—22 to 30 inches, gray (N 5/0) silty clay; moderate, thick, prismatic structure that breaks to moderate, to strong, medium, angular blocky structure; hard when dry, plastic when wet; many, fine, distinct mottles of dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6–5/8); patchy clay films on peds; gray (5Y 5/1) organic stains; neutral; clear, wavy boundary.

B3g—30 to 36 inches, gray (N 5/0) light silty clay; weak, thick, prismatic structure that breaks to moderate, medium, angular blocky structure; hard when dry, plastic when wet; many, medium, distinct mottles of yellowish brown (10YR 5/6–5/8) and brownish yellow (10YR 6/8); moderately alkaline; gradual, irregular boundary.

Cg—36 to 60 inches, grayish-brown to light olive-brown (2.5Y 5/3) and light brownish-gray (2.5Y 6/2) heavy silty clay loam; weak, thick, platy structure; slightly hard when dry, slightly plastic when wet; many, medium, distinct mottles of yellowish brown (10YR 5/6–5/8); highly calcareous.

The texture of the surface layer is dominantly silty clay but ranges to silt loam in places. The subsoil ranges from silty clay to clay. The underlying material occurs at a depth of 24 to 36 inches and is mainly laminated silty clay loam, silty clay, and clay. In some areas layers of loamy and sandy material are at a depth of 40 inches or more.

The Montgomery soils differ from the Colwood soils in that they developed from finer textured lacustrine sediments. They differ from the Pella soils in having a silty clay or clay rather than a silty clay loam subsoil.

Montgomery silty clay (0 to 2 percent slopes) (Mzc).—This soil occurs on flats, in depressions, and along drainageways. Included with this soil in mapping are areas that have a thinner surface layer than the typical one. Also included are some areas having slopes of 2 to 3 percent.

This soil is moderately limited for crop use. Drainage is needed because of a high water table that is seasonally less than 1 foot below the soil surface. Hard clods form when this soil is worked under wet field conditions. (Capability unit IIw-1; recreation group 7; wildlife group 5; urban trees group 6)

Morley Series

The Morley series is made up of well drained or moderately well drained soils that developed in a thin silt mantle and the underlying clay loam to silty clay loam glacial till (fig. 6). These gently sloping to steep soils occupy ridges and knobs. The native vegetation was hardwood forest.

In a typical profile the surface layer is medium acid, dark grayish-brown to very dark grayish-brown silt loam about 9 inches thick.

The subsoil is about 26 inches thick. The upper part is strongly acid and medium acid, dark-brown to brown silty clay. The lower part is calcareous, dark-brown to brown silty clay.

The underlying material is highly calcareous, yellowish-brown silty clay loam that contains many strong-brown mottles and a few shale chips.

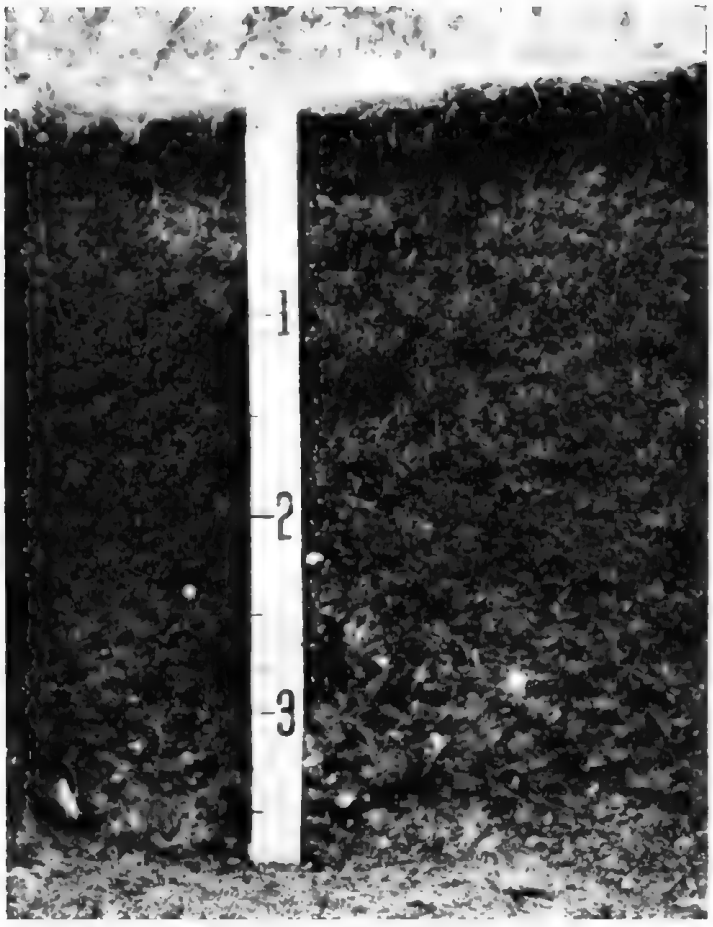

Figure 6.—**Profile of a Morley silt loam.**

The Morley soils have high available moisture capacity, moderately slow permeability, and medium internal drainage. Surface runoff ranges from medium on gentle slopes to very rapid on moderately steep, eroded slopes. The tilth of these soils is good on slightly or moderately eroded slopes but is poor on severely eroded areas. Roots penetrate to a depth of 5 feet or more. The fertility in these soils is moderate.

Typical profile of Morley silt loam, 2 to 6 percent slopes, in a cultivated field (SW¼SW¼ sec. 34, T. 3 N., R. 20 E., Racine County):

Ap1—0 to 8 inches, dark grayish-brown (10YR 4/2) to very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, subangular blocky structure that breaks to moderate, medium, granular structure; friable; plentiful plant roots; some earthworm casts and holes; medium acid; abrupt, smooth boundary.

Ap2—8 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, platy structure; friable; plentiful plant roots; few earthworm holes and casts; medium acid; abrupt, smooth boundary.

B1—9 to 16 inches, dark-brown to brown (10YR 4/3) light silty clay; moderate, medium, subangular blocky structure; firm; grayish-brown (10YR 5/2) granular coatings on ped surfaces; plentiful plant roots; strongly acid; gradual, wavy boundary.

IIB2t—16 to 25 inches, dark-brown to brown (10YR 4/3) heavy silty clay; moderate, medium, prismatic structure that breaks to moderate, medium, angular blocky structure; hard when dry and slightly plastic when wet; continuous clay films; black (10YR 2/1) patchy stains of organic matter; 2-inch clay loam layer that appears to be an old eroded surface occurs at the contact of this horizon and the IIB3t horizon; plentiful plant roots; medium acid; gradual, wavy boundary.

IIB3t—25 to 35 inches, dark-brown to brown (10YR 4/3) silty clay; compound moderate, medium, prismatic and moderate, medium, angular blocky structure; hard when dry and slightly plastic when wet; few plant roots; clay films, mostly on vertical ped faces; black (10YR 2/1) patchy stains of organic matter; a few, fine, distinct mottles of strong brown (7.5YR 5/6); calcareous; gradual, irregular boundary.

IIC—35 to 45 inches +, yellowish-brown (10YR 5/4) silty clay loam glacial till; weak, thick, platy structure that breaks to weak, medium, angular blocky structure; hard when dry and slightly plastic when wet; few plant roots; a few light-gray (10YR 7/1) soft lime concretions that increase in abundance with depth; many, fine, distinct mottles of strong brown (7.5YR 5/6); few shale chips and glacial pebbles; highly calcareous.

In undisturbed areas the surface layer ranges from 3 to 6 inches in thickness. The color of the surface layer varies from very dark gray (10YR 3/1) to dark gray (10YR 4/1). The solum ranges from 24 to 36 inches in thickness, and the silt mantle is from 10 to 20 inches thick. The underlying material is generally clay loam to silty clay loam, but in places it is heavy silt loam or silty clay. On gentle slopes a few, fine, faint mottles of yellowish brown (10YR 5/4–5/6) are in the lower solum.

The Morley soils have a thinner and lighter colored A1 horizon than the Varna soils.

Morley silt loam, 2 to 6 percent slopes (MzdB).—This soil occurs on low ridges and knobs. Slopes are convex and generally less than 300 feet in length. Soils of the Blount, Beecher, and Ashkum series occupy lower slopes and drainageways that extend into Morley soil areas in an irregular pattern. This soil has the profile described as typical for the series. Included with this soil in mapping are small areas of Markham silt loam, Hebron silt loam, Beecher silt loam, and Blount silt loam. Also included are areas of nearly level and moderately eroded Morley silt loam.

The gentle slopes slightly limit the use of this soil for crops. (Capability unit IIe–6; recreation group 3; wildlife group 1; urban trees group 2)

Morley silt loam, 2 to 6 percent slopes, eroded (MzdB2).—This soil occurs on low ridges and knobs. Slopes are convex and generally less than 300 feet in length. Blount, Beecher, and Ashkum soils occupy the lower slopes and drainageways that extend into Morley soil areas in an irregular pattern. This Morley soil has a thinner and lighter colored surface layer than that described as typical for the series. As much as two-thirds of the surface layer has been removed through erosion. Because of the eroded condition, this soil also has a thinner subsoil than typical. Included in mapping are areas of Markham silt loam and Hebron silt loam. Also included are some small slightly eroded areas.

The gentle slopes slightly limit this soil for crop use. The loss of surface soil results in a tilth problem and poorer growth of crops. If tilled when wet, this soil tends to dry in hard lumps and clods. (Capability unit IIe–6; recreation group 3; wildlife group 1; urban trees group 2)

Morley silt loam, 6 to 12 percent slopes (MzdC).—The depth to the underlying glacial till is slightly less in this soil than in the soil described as typical for the series. Small areas of Markham soils are included with this soil in mapping.

The soil is subject to moderate erosion and has moderately slow permeability. These are moderate limitations that affect cropping. (Capability unit IIIe–6; recreation group 3; wildlife group 1; urban trees group 2)

Morley silt loam, 6 to 12 percent slopes, eroded (MzdC2).—This soil lies on ridges and knobs. Blount, Beecher, and Ashkum soils occupy adjacent lower slopes and drainageways. This soil has a thinner and lighter colored surface layer than that described as typical for the series. It also has a thinner subsoil than typical. As much as two-thirds of the surface layer has been removed through erosion. Included in mapping are small areas of Markham silt loam. Also included are a few areas of severely eroded and slightly eroded Morley silt loam, mostly in woodlots.

The slope moderately limits this soil for crop use. The loss of surface soil causes poor tilth and lower crop yields. If tilled under wet field conditions, this soil tends to dry in hard lumps and clods. (Capability unit IIIe–6; recreation group 3; wildlife group 1; urban trees group 2)

Morley silt loam, 12 to 20 percent slopes (MzdD).—This soil is on ridges and knobs. Slopes are convex. This soil is slightly less deep to glacial till than the soil described as typical for the series. Small areas of gently sloping and steep Morley soils and eroded soils are included with this soil in mapping.

Runoff is rapid on this soil, and the erosion hazard is severe. Consequently, use of the soil for crops is severely limited. (Capability unit IVe–6; recreation group 3; wildlife group 1; urban trees group 2)

Morley silt loam, 12 to 20 percent slopes, eroded (MzdD2).—This soil occurs on ridges and knobs. Slopes

are convex and generally less than 200 feet in length. Blount and Ashkum soils, as well as other Morley soils, occupy adjacent lower slopes and drainageways. This soil has a thinner surface layer and subsoil than described as typical for the series. As much as two-thirds of the surface layer has been removed through erosion. In many places, the mixing of the upper subsoil with the plow layer gives the surface layer a silty clay loam texture. Included with this soil in mapping are some slightly eroded areas that are mostly in woodlots and a few severely eroded areas.

The strong slope severely limits this soil for crop use. The loss of surface soil causes poor tilth and unfavorable growth of crops. If tilled when wet, this soil tends to form hard lumps and clods as it dries. (Capability unit IVe–6; recreation group 3; wildlife group 1; urban trees group 2)

Morley silt loam, 20 to 30 percent slopes (MzdE).—This steep soil is on ridges. Slopes are convex and generally less than 200 feet in length. Soils of the Blount and Ashkum series occupy lower slopes and drainageways. This soil has a thinner surface layer and subsoil than the typical soil. Included in mapping are some areas of moderately and severely eroded Morley soils.

The strong slope severely limits this soil for crop use. (Capability unit VIe–6; recreation group 3; wildlife group 1; urban trees group 2)

Morley soils, 6 to 12 percent slopes, severely eroded (MzeC3).—These sloping soils occur on ridges and knobs. Slopes are convex and generally less than 300 feet in length. Blount and Ashkum soils occupy adjacent lower slopes and drainageways. These Morley soils have a thinner, lighter colored, and finer textured surface layer than that described as typical for the series. The combined thickness of the surface layer and subsoil also is less than typical. More than two-thirds of the surface layer has been removed through erosion. Tillage has mixed the upper subsoil with the plow layer, thus forming a present surface layer that includes silt loam, loam, and silty clay loam.

The slope and severe erosion moderately limit these soils for crop use. Hard clods tend to be formed if the soil is worked when wet. Crop growth is less than on slightly eroded Morley soils. (Capability unit IVe–6; recreation group 3; wildlife group 1; urban trees group 2)

Morley soils, 12 to 20 percent slopes, severely eroded (MzeD3).—These soils lie on ridges and knobs. Slopes are convex and generally less than 300 feet in length. Blount and Ashkum soils occupy adjacent lower slopes and drainageways. These Morley soils have a thinner, lighter colored, and finer textured surface layer than that described as typical for the series. Their subsoil is also thinner than typical. More than two-thirds of the surface layer has been removed through erosion. Some of the upper subsoil has mixed into the plow layer by tillage, and therefore the texture of the surface layer includes silt loam, loam, and silty clay loam.

The strong slope and erosion hazard severely limit these soils for crop use. The soils tend to form hard clods if they are worked when wet. Crop growth is noticeably less than on slightly eroded Morley soils. (Capability unit VIe–6; recreation group 3; wildlife group 1; urban trees group 2)

Mundelein Series

In the Mundelein series are loamy, somewhat poorly drained soils that developed from laminated lacustrine silt, very fine sand, and fine sand. These nearly level to gently sloping soils occupy flats, drainageways, and depressions. The native vegetation was water-tolerant grasses and shrubs.

In a typical profile the surface layer is neutral, very dark brown silt loam about 10 inches thick.

The subsoil is about 15 inches thick. The upper part is neutral, dark-brown heavy silt loam containing a few mottles of yellowish brown. The next layer is neutral, dark-brown to dark yellowish-brown silty clay loam that has common yellowish-brown mottles and a few dark-gray mottles. It is underlain by neutral, dark-brown to brown silty clay loam containing many mottles of yellowish brown and dark gray. The lower subsoil is mildly to moderately alkaline, yellowish-brown silt loam marked with a few strong-brown mottles.

The underlying material is calcareous, light yellowish-brown stratified silt and very fine sand. Many strong-brown mottles are present.

These soils have high available moisture capacity, slow surface runoff, moderate permeability, and slow internal drainage. The tilth of these soils is good, and their fertility is moderate. Roots penetrate to the water table, which, seasonally, is less than 3 feet from the soil surface.

Typical profile of Mundelein silt loam, 1 to 3 percent slopes, in a cultivated field (NW¼SE¼ sec. 30, T. 2 N., R. 20 E., Kenosha County):

Ap—0 to 10 inches, very dark brown (10YR 2/2) silt loam; moderate, medium, subangular blocky structure that breaks to moderate, medium, granular structure; very friable; neutral; abrupt, smooth boundary.

B21t—10 to 13 inches, dark-brown (10YR 3/3) heavy silt loam; moderate, fine, subangular blocky structure; firm; few, fine, distinct mottles of yellowish brown (10YR 5/4); continuous clay films on peds; neutral; clear, smooth boundary.

B22t—13 to 16 inches, dark-brown to dark yellowish-brown (10YR 3/3–3/4) silty clay loam; weak to moderate, medium subangular blocky structure that breaks to moderate, fine, angular blocky structure; firm; common, fine, distinct mottles of yellowish brown (10YR 5/4) and a few, fine, distinct mottles of dark gray (10YR 4/1); continuous clay films on peds; neutral; clear, smooth boundary.

B23t—16 to 20 inches, dark-brown to brown (10YR 4/3) silty clay loam; weak to moderate, medium and coarse, subangular blocky structure that breaks to moderate, fine, angular blocky structure; firm; many, fine, distinct mottles of yellowish brown (10YR 5/4) and common, fine, distinct mottles of dark gray (10YR 4/1); patchy clay films on peds; neutral; clear, smooth boundary.

B3—20 to 25 inches, yellowish-brown (10YR 5/4) silt loam; weak, coarse, subangular blocky structure; friable; few, fine, distinct mottles of strong brown (7.5YR 5/6); mildly to moderately alkaline; clear, smooth boundary.

C—25 to 60 inches, light yellowish-brown (10YR 6/4), laminated silt and very fine sand; massive and single grain; loose and friable; many, medium, distinct mottles of strong brown (7.5YR 5/6); highly calcareous.

The texture of the subsoil ranges from heavy loam to silty clay. The depth to the underlying material ranges from 24 to 42 inches. This material is mainly laminated silt, very fine sand, and fine sand, but in some areas layers of loamy and clayey material occur at a depth of 40 inches or more.

The Mundelein soils resemble the Martinton soils in drainage and color characteristics, but they developed from silt and fine sand rather than from clayey sediments.

Mundelein silt loam, 1 to 3 percent slopes (MzfA).—This soil lies in depressions and along drainageways. Included in mapping are some areas that have thin layers of sand and gravel in the upper part of the underlying material. Also included are areas that have a loam surface layer.

If properly drained, this soil has only slight limitations affecting its use for crops. (Capability unit IIIw–3; recreation group 5; wildlife group 12; urban trees group 6)

Muskego Series

The Muskego series consists of very poorly drained peats and mucks that occupy depressions. These soils developed from moderately well disintegrated reeds and sedges underlain by sedimentary peat at depths of 24 to 42 inches. Large areas of Muskego soils occur in sections 10 and 11, Paris Township, Kenosha County. Where these soils occupy depressions less than 10 acres in size, they commonly occur with the poorly drained Ashkum, Pella, or Drummer, gravelly substratum, soils. In larger depressions, the Muskego soils are commonly found with the Houghton soils.

In a typical profile the surface layer is neutral, black muck about 8 inches thick. Underlying this layer is about 16 inches of neutral to slightly acid, dark reddish-brown mucky peat that is layered and contains many plant remains. The next layer, about 7 inches thick, is slightly acid, very dark brown sedimentary peat that has a rubbery consistence. There are few recognizable plant remains. This layer is underlain by neutral, very dark grayish-brown raw sedimentary peat about 11 inches thick. It is friable and has many discernible plant remains. The next 6 inches, of similar material, is dark grayish brown. It is underlain by 8 inches of mildly alkaline, dark olive-gray to olive-gray raw sedimentary peat that has some recognizable plant remains.

The underlying material is calcareous, olive-gray silty clay loam.

These soils have very high available moisture capacity. They have moderately slow permeability, very slow internal drainage, and very slow to ponded surface runoff. Their fertility is low. Plant roots readily penetrate to the water table, which is generally near the surface.

Typical profile of Muskego muck in a cultivated area (SW¼SW¼ sec. 11, T. 2 N., R. 21 E., Kenosha County):

1—0 to 8 inches, black (N 2/0) muck; weak, medium, subangular blocky structure that breaks to moderate to strong, medium, granular structure; very friable; discernible plant remains make up less than 10 percent of the mass; neutral; clear, smooth boundary.

2—8 to 24 inches, dark reddish-brown (5YR 2/2) mucky peat; layered; very friable; abundant plant remains make up 50 to 75 percent of the mass; neutral to slightly acid; abrupt, smooth boundary.

3—24 to 31 inches, very dark brown (10YR 2/2) sedimentary peat; layered; rubbery consistence; a few discernible plant roots; slightly acid; abrupt, smooth boundary.

4—31 to 42 inches, very dark grayish-brown (2.5Y 3/2) raw sedimentary peat; fibrous; friable; discernible plant remains make up about 80 percent of the mass; mostly broad-leaved (5 to 15 millimeters) plant remains; neutral; abrupt, smooth boundary.

5—42 to 48 inches, dark grayish-brown (2.5Y 4/2) raw sedimentary peat; fibrous; friable; discernible plant remains compose about 80 percent of the mass; the remains mostly from broad leaves (5 to 15 millimeters across); neutral; abrupt, smooth boundary.

6—48 to 56 inches, dark olive-gray (5Y 3/2) to olive-gray (5Y 4/2) raw sedimentary peat; massive; friable; high mineral percent; discernible plant remains make up less than 50 percent of the mass; mildly alkaline; abrupt, smooth boundary.

IIBgb—56 to 60 inches, olive-gray (5Y 4/2) silty clay loam; massive; firm; calcareous.

Sedimentary peat layers occur at a depth of 20 to 36 inches. Depth to the underlying mineral soil ranges from 24 to 56 inches. The color of the sedimentary peat layers darkens rapidly when exposed to the air. If dried, sedimentary peat becomes strongly platy, absorbs water very slowly, and remains hard and lumpy for long periods of time.

Where the Houghton and Muskego soils occur in the same depression or valley, the Muskego soils are generally along the edge of the organic soil area. The Houghton soils consist of organic deposits greater than 42 inches deep.

Muskego muck (0 to 2 percent slopes) (Mzg).—This soil occupies depressions about 2 acres in size, and it also occurs in low areas that are 200 to 300 acres in size. It commonly occurs with Houghton soils. Included with this soil in mapping are small areas of Houghton and Ashkum soils.

This Muskego soil is severely limited for crop use because water percolates very slowly through the sedimentary peat layers. Excess water cannot be readily removed by drainage. (Capability unit Vw–14; recreation group 8; wildlife group 9; urban trees group 9)

Mussey Series

The Mussey series is made up of poorly drained, loamy soils underlain by outwash sand and gravel. These nearly level soils occupy flats, depressions, and drainageways of high terraces near the major streams of the survey area. The native vegetation was water-tolerant grasses and shrubs.

In a typical profile the surface layer is mildly alkaline, black loam about 6 inches thick. The subsurface layer, about 3 inches thick, is neutral, very dark gray loam.

The subsoil is about 10 inches thick. It is neutral, gray and olive-gray loam and sandy clay loam mottled with yellowish brown.

The underlying material is calcareous, olive medium sand.

Surface runoff on these soils is very slow. Surface water is ponded in spring or during periods of heavy rainfall. These soils also have very slow internal drainage, moderate permeability, and medium available moisture capacity. Roots readily penetrate to the water table, or where drainage practices are established, to the underlying material.

Typical profile of Mussey loam in an undisturbed area (NE¼NE¼ sec. 34, T. 3 N., R. 19 E., Racine County):

A1—0 to 6 inches, black (10YR 2/1) loam; weak, fine, granular structure; very friable; mildly alkaline; clear, smooth boundary.

A3—6 to 9 inches, very dark gray (10YR 3/1) loam; weak, medium, granular structure; friable; neutral; clear, smooth boundary.

B1g—9 to 12 inches, gray (5Y 5/1) loam; moderate, medium, subangular blocky structure; friable; few, fine, distinct mottles of yellowish brown (10YR 5/6); neutral; clear, smooth boundary.

B2g—12 to 17 inches, olive-gray (5Y 5/2) sandy clay loam; moderate, medium, subangular blocky structure; firm; many, medium, distinct mottles of yellowish brown (10YR 5/6); neutral; clear, smooth boundary.

B3g—17 to 19 inches, olive-gray (5Y 5/2) loam; weak, medium, subangular blocky structure; firm; many, fine, distinct mottles of yellowish brown (10YR 5/6); neutral; clear, smooth boundary.

Cg—19 to 60 inches, olive (5Y 5/3) medium sand; single grain; loose; calcareous.

The solum ranges from 12 to 24 inches in thickness but generally is between 16 and 20 inches thick. It is neutral and mildly alkaline in reaction. In the A horizon the dominant texture is loam, but in some areas it is silt loam. The A horizon ranges from 6 to 12 inches in thickness and in some places has a very thin organic layer. Texture of the B horizon ranges from clay loam to gravelly loam. Gravel is largely dolomite.

The Mussey soils have a thinner solum than the associated Sebewa soils.

Mussey loam (0 to 2 percent slopes) (Mzk).—This soil occupies the depressions and drainageways of terraces. Included in mapping are spots of Fabius and Sebewa soils. Also included are small areas of Mussey soils that have a sandy loam or a silt loam surface layer.

If properly drained, this soil has slight limitations for crop use. (Capability unit IIIw–5; recreation group 6; wildlife group 5; urban trees group 6)

Navan Series

In the Navan series are loamy, poorly drained soils that developed from outwash material over laminated lacustrine silt and clay or over clayey glacial till. These nearly level to gently sloping soils occupy flats, drainageways, and depressions. The native vegetation was water-tolerant grasses and shrubs.

In a typical profile the surface layer is neutral, black silt loam about 10 inches thick. The subsurface layer, about 5 inches thick, is neutral, very dark brown loam.

The subsoil is about 23 inches thick. The upper part is mildly alkaline, grayish-brown heavy loam that is marked with common mottles of yellowish brown. The next layer is mildly alkaline, grayish-brown clay loam containing common mottles of strong brown. It is underlain by mildly alkaline, olive-gray sandy clay loam that has common strong-brown mottles. The lower subsoil is calcareous, gray to light-gray silty clay marked with many strong-brown mottles.

The underlying material is calcareous, gray to light-gray silty clay that contains strong-brown mottles.

These soils have high available moisture capacity, ponded to very slow surface runoff, slow permeability, and very slow internal drainage. The tilth of these soils is good, and their fertility is high. Roots penetrate to the water table, which, seasonally, is less than 1 foot from the soil surface.

Typical profile of Navan silt loam in a cultivated field (SW¼SE¼ sec. 24, T. 2 N., R. 19 E., Racine County):

Ap—0 to 10 inches, black (10YR 2/1) silt loam; weak, fine, granular structure; very friable; neutral; abrupt, smooth boundary.

A1—10 to 15 inches, very dark brown (10YR 2/2) loam; weak, medium, granular structure; friable; neutral; clear, smooth boundary.

B1g—15 to 20 inches, grayish-brown (2.5Y 5/2) heavy loam; weak, medium, subangular blocky structure; firm; common, medium, distinct mottles of yellowish brown (10YR 5/6); black (10YR 2/1) organic stains; mildly alkaline; clear, smooth boundary.

B2tg—20 to 27 inches, grayish-brown (2.5Y 5/2) clay loam; moderate, medium, subangular blocky structure; very firm; common, medium, distinct mottles of strong brown (7.5YR 5/6); black (10YR 2/1) organic stains; patchy clay films on peds; mildly alkaline; clear, smooth boundary.

B31tg—27 to 35 inches, olive-gray (5Y 5/2) sandy clay loam; moderate, medium, subangular blocky structure; firm; patchy clay films; common, medium, distinct mottles of strong brown (7.5YR 5/6); mildly alkaline; clear, smooth boundary.

IIB32g—35 to 38 inches, gray to light-gray (5Y 6/1) silty clay; moderate, medium, subangular blocky structure; very firm; many, medium, prominent mottles of strong brown (7.5YR 5/8); calcareous; clear, smooth boundary.

IICg—38 to 60 inches, gray to light-gray (5Y 6/1) silty clay; massive; very firm; many, medium, prominent mottles of strong brown (7.5YR 5/8); highly calcareous.

The surface layer is generally silt loam, but in places it ranges to silty clay loam. Contact between the outwash and underlying clayey material generally occurs in the lower subsoil. In some areas as much as 6 inches of leached outwash material occurs between the solum and the underlying clayey material. The thickness of the solum ranges from 24 to 40 inches. Where the underlying material consists of clayey glacial till, subsoil textures range from clay loam to silty clay. The lacustrine deposits, in some areas, include layers of very fine sand and fine sand at a depth of 40 inches or more.

The Navan soils differ from the Montgomery soils in having a coarser textured upper subsoil that developed from outwash material rather than from clayey sediments.

Navan silt loam (0 to 3 percent slopes) (Na).—This soil occupies drainageways and depressions in lake-laid areas. Included with this soil in mapping are areas of Ashkum silty clay loam and Sebewa silt loam, clayey substratum. Also included are areas that have a loam surface layer.

If properly drained, this soil has only slight limitations that affect its use for crops. (Capability unit IIw–1; recreation group 6; wildlife group 5; urban trees group 6)

Ogden Series

The Ogden series consists of mucky, very poorly drained soils that developed from plant remains. Clayey material is at a depth of less than 42 inches. These nearly level soils occur on flats and in depressions with the Palms and Adrian soils. The native vegetation was water-tolerant grasses, sedges, and shrubs.

In a typical profile the surface layer is mildly alkaline, black muck about 18 inches thick. It is underlain by a subsurface layer, about 8 inches thick, that is mildly alkaline, black mucky peat.

The upper 4 inches of the underlying material is mildly alkaline, black silty clay. The lower part of the underlying material is calcareous, gray silty clay loam.

These soils have high available moisture capacity, ponded to very slow surface runoff, and very slow internal drainage. If the soils are drained, roots penetrate to the water table or to the underlying clayey material. The fertility in these soils is low.

Typical profile of Ogden muck in an undisturbed area (SE¼SE¼ sec. 21, T. 2 N., R. 19 E., Racine County):

1—0 to 18 inches, black (N 2/0) muck; moderate to strong, medium, granular structure; very friable; mildly alkaline; clear, wavy boundary.
2—18 to 26 inches, black (10YR 2/1) mucky peat; weak to moderate, medium, platy structure; friable; mildly alkaline; abrupt, wavy boundary.
IIAb—26 to 30 inches, black (10YR 2/1) silty clay; massive; firm; mildly alkaline; abrupt, wavy boundary.
IIBbg—30 to 48 inches, gray (5Y 5/1) silty clay loam; massive; firm; calcareous.

The surface layer ranges from black (N 2/0) to very dark brown (10YR 2/2) in color. The reaction ranges from medium acid to moderately alkaline. The underlying material varies from clay loam to clay and occurs at depths of 12 to 42 inches.

The Palms and Adrian soils differ from the Ogden soils in being underlain by loam and sand, respectively.

Ogden muck (0 to 2 percent slopes) (Oc).—This soil occupies depressions. Included with this soil in mapping are small areas of Houghton muck and Palms muck.

If properly drained, this soil is moderately limited for crop use. It is low in fertility, and, if drained, is subject to subsidence and soil blowing. (Capability unit IIIw–9; recreation group 8; wildlife group 9; urban trees group 9)

Palms Series

In the Palms series are mucky, very poorly drained soils that developed from plant remains. They are underlain by loamy material at a depth of less than 42 inches. These nearly level soils lie on flats and in depressions, and they commonly occur with the deep organic Houghton soils and with the Adrian and Ogden soils. The native vegetation was water-tolerant grasses, sedges, and shrubs.

In a typical profile the surface layer is neutral, very dark brown muck at about 25 inches thick.

The upper part of the underlying mineral material is about 4 inches thick. It is calcareous, dark-gray silty clay loam containing many mottles of dark brown to brown. Below a depth of 29 inches, the material is calcareous, dark-gray loam grading to very dark grayish-brown gravelly sandy loam and dark grayish-brown clay loam.

These soils have high available moisture capacity, ponded to very slow surface runoff, and very slow internal drainage. Roots penetrate to the water table or, if the soil is drained, to the underlying material. The fertility in these soils is low.

Typical profile of Palms muck in an undisturbed area (NE¼SW¼ sec. 14, T. 1 N., R. 20 E., Kenosha County):

1—0 to 25 inches, very dark brown (10YR 2/2) muck; moderate, medium, granular structure; very friable; neutral; clear, irregular boundary.
IIA11b—25 to 29 inches, dark-gray (5Y 4/1) silty clay loam; massive; sticky when wet; many, medium, distinct mottles of dark brown to brown (7.5YR 4/4); highly calcareous; abrupt, wavy boundary.
IIA12b—29 to 34 inches, dark-gray (5Y 4/1) loam; weak, medium, granular structure; very sticky when wet; calcareous; abrupt, wavy boundary.
IIBbg—34 to 37 inches, very dark grayish-brown (2.5Y 3/2) gravelly sandy loam; single grain; slightly sticky when wet; calcareous; abrupt, wavy boundary.
IIC—37 to 60 inches, dark grayish-brown (10YR 4/2) light clay loam; massive; sticky when wet; many, medium, distinct mottles of gray (10YR 5/1) and yellowish brown (10YR 5/4–5/6); highly calcareous.

The surface layer ranges in color from black (N 2/0) to very dark brown (10YR 2/2). This organic layer is slightly acid or neutral. The underlying mineral material is calcareous, commonly stratified sandy loam to silty clay loam. The depth to the loamy material ranges from 12 to 42 inches.

Like the Palms soils, the Adrian and Ogden soils also are shallow organic soils, but they are underlain by sand and clay, respectively.

Palms muck (0 to 2 percent slopes) (Pa).—This soil is in depressions. Included with this soil in mapping are small areas of Houghton muck, Adrian muck, and Ogden muck.

If properly drained, this soil is moderately limited for crop use. It is low in fertility and, if drained, is subject to subsidence and soil blowing. (Capability unit IIIw–9; recreation group 8; wildlife group 9; urban trees group 9)

Pella Series

In the Pella series are poorly drained and very poorly drained, loamy soils that developed from silt greater than 36 inches thick. These nearly level soils occupy flats, depressions, and drainageways in old lake basins and till areas. Water-tolerant grasses and shrubs were the native vegetation.

In a typical profile the surface layer is mildly alkaline, black heavy silt loam about 11 inches thick. The subsurface layer is very dark gray to dark-gray silty clay loam marked with a few mottles of dark yellowish brown. It is mildly alkaline and about 4 inches thick.

The subsoil is about 17 inches thick. The upper part is mildly to moderately alkaline, dark grayish-brown silty clay loam that contains common yellowish-brown mottles. The lower subsoil is calcareous, light olive-brown silty clay loam marked with common mottles of gray and yellowish brown.

The underlying material is very highly calcareous and shows many yellowish-brown mottles. It is gray to light brownish-gray silty clay loam in the upper part but becomes gray to light-gray heavy silt loam at a depth of 48 inches.

Surface runoff on these soils is very slow to ponded. The soils have moderately slow permeability, very slow internal drainage, and high available moisture capacity. Their fertility is high. Plant roots readily penetrate to the depth of the water table.

Typical profile of Pella silt loam in a cultivated field (SW¼SE¼ sec. 10, T. 1 N., R. 22 E., Kenosha County):

Ap—0 to 8 inches, black (10YR 2/1) heavy silt loam; weak, medium, subangular blocky structure that breaks to moderate, medium, granular structure; very friable; mildly alkaline; clear, smooth boundary.

A1—8 to 11 inches, black (10YR 2/1) heavy silt loam; weak, medium, subangular blocky structure; friable; mildly alkaline; clear, irregular boundary.

A3g—11 to 15 inches, very dark gray (5Y 3/1) to dark-gray (5Y 4/1) silty clay loam; weak, medium, subangular blocky structure that breaks to moderate, fine, subangular blocky structure; firm; few, fine, distinct mottles of dark yellowish brown (10YR 4/4); mildly alkaline; clear, irregular boundary.

B2g—15 to 26 inches, dark grayish-brown (2.5Y 4/2) silty clay loam; moderate, fine, subangular blocky structure; firm; common, fine, distinct mottles of yellowish brown (10YR 5/6); mildly to moderately alkaline; clear, irregular boundary.

B3g—26 to 32 inches, light olive-brown (2.5Y 5/4) silty clay loam; weak, fine, subangular blocky structure; friable; common, medium, distinct mottles of gray (10YR 5/1) and yellowish brown (10YR 5/6); light-gray (10YR 7/1) hard lime concretions; calcareous; clear, irregular boundary.

C1—32 to 48 inches, gray (10YR 6/1) to light brownish-gray (10YR 6/2) light silty clay loam; massive, breaking to weak, fine, subangular blocky structure; friable; many, medium, distinct mottles of yellowish brown (10YR 5/6); very highly calcareous; clear, wavy boundary.

C2—48 to 60 inches +, gray to light-gray (10YR 6/1) heavy silt loam; massive; friable; many, coarse, distinct mottles of yellowish brown (10YR 5/6) make up about 50 percent of the mass; very highly calcareous.

In cultivated areas the color of the surface layer ranges to very dark gray (10YR 3/1). The texture of the subsoil ranges from heavy silt loam to heavy silty clay loam. Mottles in the subsoil decrease in abundance, size, and contrast and are replaced by intense gray colors where drainage is very poor. The solum is neutral to moderately alkaline. The underlying material generally has a silty clay loam or heavy silt loam texture, but in places it includes layers of silty clay, silt, silt loam, and loam.

The Pella soils lack the horizons of silty clay and clay that are present in the Montgomery soils.

Pella silt loam (0 to 2 percent slopes) (Ph).—This soil occupies broad lake-laid areas. Included with this soil in mapping are areas that have a silty clay loam surface layer. Also included are areas where the surface layer is more than 15 inches thick.

If properly drained, this soil has slight limitations for crop use. (Capability unit IIw–1; recreation group 6; wildlife group 5; urban trees group 6)

Plano Series

The Plano series consists of loamy, well-drained soils that developed in a moderately thick silt mantle over sand and gravel outwash. These nearly level soils occupy flats and terraces in the western part of the survey area. The native vegetation was prairie grasses.

In a typical profile the surface layer is neutral, very dark brown silt loam about 9 inches thick. The subsurface layer, about 3 inches thick, is neutral, very dark grayish-brown silt loam.

The subsoil is about 38 inches thick. The upper part is slightly acid to neutral, dark-brown to brown heavy silt loam. It is underlain by medium to slightly acid, dark-brown and dark yellowish-brown silty clay loam. The next layer is slightly acid, yellowish-brown loam. The lower subsoil is neutral, dark-brown to brown sandy clay loam.

The underlying material is highly calcareous, yellowish-brown, stratified sand and gravel.

These soils have medium available moisture capacity, slow surface runoff, moderate permeability, and medium internal drainage. Their tilth is good, and fertility is high. Roots readily penetrate to the sand and gravel.

Typical profile of Plano silt loam, gravelly substratum, in a cultivated field (NE¼SW¼ sec. 20, T. 1 N., R. 19 E., Kenosha County):

Ap—0 to 9 inches, very dark brown (10YR 2/2) silt loam; moderate, very fine, subangular blocky structure; friable; neutral; abrupt, smooth boundary.

A3—9 to 12 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, subangular blocky structure that breaks to moderate, medium, granular structure; friable; neutral; clear, wavy boundary.

B1—12 to 17 inches, dark-brown to brown (10YR 4/3) heavy silt loam; moderate, medium, subangular blocky structure; friable; slightly acid to neutral; gradual, wavy boundary.

B21t—17 to 25 inches, dark-brown (10YR 4/3) silty clay loam; moderate, fine and medium, subangular blocky structure; firm; patchy clay films; medium to slightly acid; gradual, wavy boundary.

B22t—25 to 42 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; patchy clay films; medium to slightly acid; clear, wavy boundary.

IIB31—42 to 45 inches, yellowish-brown (10YR 5/4) loam; weak, medium, subangular blocky structure; firm; slightly acid; clear, wavy boundary.

IIB32—45 to 50 inches, dark-brown to brown (10YR 3/3) sandy clay loam; weak, coarse, subangular blocky structure; friable; neutral; clear, irregular boundary.

IIC—50 inches +, yellowish-brown (10YR 5/4), stratified outwash sand and gravel; single grain; loose; highly calcareous.

The thickness of the solum ranges from 40 to 56 inches or more. Because the silt mantle ranges from 30 to 50 inches in thickness, most of the solum has formed in silt. Horizons of the lower solum that developed in outwash material have a sandy loam to light loam texture where the underlying material is primarily sand rather than sand and gravel.

The Plano soils developed in a thicker silt mantle and have a thicker solum than the Warsaw and Kane soils.

Plano silt loam, gravelly substratum (0 to 2 percent slopes) (Pt).—This soil lies on flats on high terraces. Included with this soil in mapping are areas of moderately well drained soils that are mottled in the lower subsoil and underlying material. Also included are some gently sloping areas.

This is one of the best soils for farming in the survey area. It has very slight limitations for crop use. (Capability unit I–1; recreation group 1; wildlife group 11; urban trees group 1)

Radford Series

The Radford series is made up of somewhat poorly drained soils that consist of silty local alluvium recently deposited on older developed profiles. These nearly level to gently sloping soils occupy small depressions, drainageways, and other wet areas that adjoin or are near

eroded slopes. Well-drained soils, such as the Morley, Fox, Casco, Miami, and McHenry, generally are the eroded soils that contribute the alluvial material.

In a typical profile the surface layer is neutral, very dark grayish-brown silt loam about 24 inches thick. The upper part of the subsurface layer, about 9 inches thick, is neutral, very dark grayish-brown silt loam marked with many dark-gray mottles. The lower part of the subsurface layer, about 12 inches thick, is neutral, black silty clay loam that contains many fine mottles of dark gray.

The subsoil is about 13 inches thick. The upper part is mildly alkaline, gray silty clay marked with many yellowish-brown mottles. The lower part is calcareous, gray silty clay loam that has many yellowish-brown mottles. Pebbles are present.

The underlying material is calcareous, grayish-brown clay loam marked with many grayish-brown mottles.

These soils have high available moisture capacity, slow surface runoff, moderate permeability, and slow internal drainage. Their tilth is good, and roots readily penetrate to the water table. The fertility in these soils is high.

Typical profile of Radford silt loam, 0 to 3 percent slopes, in a cultivated field (NW¼SE¼ sec. 15, T. 3 N., R. 19 E., Racine County):

A11—0 to 24 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, medium, subangular blocky structure that breaks to weak, medium, granular structure; very friable; neutral; clear, wavy boundary.

A12—24 to 33 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, medium, platy structure that breaks to weak, medium, granular structure; very friable; many, fine, distinct mottles of dark gray (N 4/0); neutral; abrupt, wavy boundary.

A1b—33 to 45 inches, black (10YR 2/1) silty clay loam; weak, medium, subangular blocky structure that breaks to moderate, medium, granular structure; friable; many, fine, distinct mottles of dark gray (7.5YR 4/0); neutral; clear, irregular boundary.

B2gb—45 to 52 inches, gray (5Y 5/1) silty clay; weak, medium, subangular blocky structure; firm; many, medium, distinct mottles of yellowish brown (10YR 5/6); patchy clay films on peds; mildly alkaline; gradual, irregular boundary.

B3gb—52 to 58 inches, gray (5Y 5/1) silty clay loam; weak, medium, subangular blocky structure; firm; pebbles; many, medium, distinct mottles of yellowish brown (10YR 5/6); calcareous; clear, irregular boundary.

Cgb—58 to 72 inches, grayish-brown (10YR 5/2) clay loam; massive; very firm; many, medium, distinct mottles of yellowish brown (10YR 5/6-5/8); pebbles; highly calcareous.

The surface layer texture is dominantly silt loam, but in places it approaches loam or silty clay loam. The depth to the buried soil ranges from 20 to 40 inches. Differences in the source of sediment cause minor color variations in the alluvial horizons. Typically, the reaction is neutral to mildly alkaline.

The Worthen and Radford soils formed from similar alluvial materials, but the Worthen soils are moderately well drained. The upper part of the Worthen soils has formed since the survey area was settled and developed for farming.

Radford silt loam, 0 to 3 percent slopes (RoA).—This soil occupies small depressions, drainageways, and wet lands that border eroded slopes. Small areas of Worthen silt loam are included with this soil in mapping.

If properly drained and protected from overflow, this soil has only slight limitations that affect its use for crops. (Capability unit IIw–2; recreation group 7; wildlife group 8; urban trees group 6)

Ringwood Series

In the Ringwood series are well-drained, loamy soils that developed in a thin silt mantle and the underlying sandy loam glacial till. These nearly level to sloping soils occupy foot slopes, ridges, and knobs. Most areas are in Waterford Township, Racine County. The native vegetation was prairie grasses.

In a typical profile the surface layer is moderately alkaline, very dark brown silt loam about 9 inches thick. The subsurface layer, about 4 inches thick, is neutral, very dark grayish-brown silt loam.

The subsoil is about 16 inches thick. The upper part is neutral, dark-brown to brown silty clay loam. The middle part is mildly alkaline, dark-brown to brown clay loam. A few pebbles as much as 1 inch in diameter occur. The lower part of the subsoil is calcareous, dark yellowish-brown light clay loam that contains pebbles, some as large as 1 inch in diameter.

The underlying material is calcareous, yellowish-brown heavy sandy loam.

These soils have high available moisture capacity, moderate permeability, medium internal drainage, and medium surface runoff. Their fertility is high. Plant roots readily penetrate the sandy loam glacial till to a depth of 5 feet or more.

Typical profile of Ringwood silt loam, 2 to 6 percent slopes, in a cultivated field (SE¼NW¼ sec. 3, T. 4 N., R. 19 E., Racine County):

Ap—0 to 9 inches, very dark brown (10YR 2/2) silt loam; weak, medium, subangular blocky structure that breaks to moderate, medium, granular structure; friable; moderately alkaline; abrupt, smooth boundary.

A3—9 to 13 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, coarse, subangular blocky structure that breaks to moderate, medium, granular structure; friable; some very dark brown (10YR 2/2) blotches from Ap horizon; neutral; clear, wavy boundary.

B21t—13 to 21 inches, dark-brown to brown (10YR 4/3) silty clay loam; moderate, medium, subangular blocky structure; friable; a few patchy clay films; neutral; gradual, wavy boundary.

IIB22t—21 to 27 inches, dark-brown to brown (10YR 4/3) clay loam; moderate to strong, medium, subangular blocky structure; firm; dark-brown (10YR 3/3) complete clay films; a few pebbles as much as 1 inch in diameter; mildly alkaline; gradual, wavy boundary.

IIB3t—27 to 29 inches, dark yellowish-brown (10YR 4/4) light clay loam; moderate, medium, subangular blocky structure; friable; a few pebbles as much as 1 inch in diameter; calcareous; gradual, wavy boundary.

IIC—29 to 40 inches +, yellowish-brown (10YR 5/4) heavy sandy loam; massive; very friable; highly calcareous.

The solum ranges from 24 to 40 inches in thickness, but it is commonly 27 to 36 inches thick. The surface layer ranges from very dark brown (10YR 2/2) to black (10YR 2/1) in color and from 7 to 10 inches or more in thickness. Because the silt mantle is 16 to 36 inches thick, most of the subsoil developed in silt. The reaction of the solum is neutral to moderately alkaline.

The Ringwood soils developed from material similar to that forming the Griswold soils. The thickness of the silt mantle is 16 to 36 inches in the Ringwood soils, whereas it is only 0 to 12 inches in the Griswold soils.

Ringwood silt loam, 2 to 6 percent slopes (RgB).—This soil occupies foot slopes and low ridges in areas of gravelly loam glacial till in northwestern Racine County. Areas commonly occur with Griswold soils. This soil has the profile described as typical for the series. Included with this soil in mapping are small areas in which the surface layer and subsoil have a combined thickness of 40 to 48 inches, and small areas having a loam surface layer. Some nearly level areas are also included.

If planted to row crops, this soil has slight limitations because of the gentle slopes and resulting erosion hazard. (Capability unit IIe–1; recreation group 1; wildlife group 3; urban trees group 1)

Ringwood silt loam, 6 to 12 percent slopes (RgC).—This soil lies on ridges and knobs in the gravelly loam glacial till areas of northeastern Racine County. It commonly occurs with the Griswold soils. This soil has a thinner surface layer and subsoil than those described as typical for the series. Included in mapping are small moderately eroded areas and small areas where the surface layer and subsoil have a total thickness of 40 to 48 inches.

The slopes and resulting erosion hazard moderately limit this soil for crop use. (Capability unit IIIe–1; recreation group 1; wildlife group 3; urban trees group 1)

Rodman Series

The Rodman series is made up of excessively drained, loamy soils that are shallow to outwash gravel. These sloping to very steep soils occur in the vicinity of the Fox River on morainic ridges and in kettle holes. The Rodman soils are so closely associated with the Casco soils that they cannot be separated at the mapping scale used and are mapped in complexes with those soils. In the Casco-Rodman complexes, the Rodman soils occupy the upper side slopes of ridges and kettle holes, and the Casco soils are on the ridge crests and lower slopes.

In a typical profile the surface layer is neutral, very dark brown gravelly loam about 5 inches thick.

The subsoil, about 4 inches thick, is moderately alkaline, strong-brown gravelly loam.

The underlying material is highly calcareous, pinkish-white gravel. It is loose and contains some cobblestones as much as 6 inches in diameter.

These soils have low available moisture capacity, medium to rapid surface runoff, rapid internal drainage, and moderate permeability. They have very low fertility.

Typical profile of a steep Rodman gravelly loam in an undisturbed area (SE¼SE¼ sec. 7, T. 2 N., R. 19 E., Racine County):

A1—0 to 5 inches, very dark brown (10YR 2/2) gravelly loam; weak, fine, granular structure; friable; neutral; clear, smooth boundary.

B—5 to 9 inches, strong-brown (7.5YR 4/6) gravelly loam; moderate, medium, granular structure; very friable; moderately alkaline; clear, irregular boundary.

C—9 to 60 inches +, pinkish-white (7.5YR 8/2) gravel; structureless; loose; some cobblestones up to 6 inches in diameter; highly calcareous.

In places the subsoil is absent or less than 4 inches thick. Coarse gravel and cobblestones are common on the surface in areas that are steeper or eroded.

The Rodman and Casco soils developed from similar outwash material, but depth to the underlying material is greater in the Casco soils, generally 12 to 20 inches.

Rollin Series

The Rollin series consists of very poorly drained, organic soils that developed from plant remains underlain by marl at a depth of less than 42 inches. These nearly level soils lie on flats and in depressions. They commonly occur with the Houghton, Ogden, and Adrian soils. The native vegetation was water-tolerant grasses and sedges.

In a typical profile the surface layer is mildly alkaline, black muck about 10 inches thick. The subsurface layer, about 22 inches thick, is moderately alkaline and calcareous, black mucky peat.

The underlying material is moderately alkaline and very highly calcareous, dark-gray to gray marl. It contains many snail shells.

These soils have high available moisture capacity, ponded to very slow runoff, and very slow internal drainage. Roots penetrate to the water table or to the underlying material if the soil is drained. These soils are low in fertility.

Typical profile of Rollin muck in a cultivated area (SE¼SW¼ sec. 34, T. 3 N., R. 19 E., Racine County):

1—0 to 10 inches, black (N 2/0) muck; moderate, medium, granular structure; very friable; mildly alkaline; clear, wavy boundary.

2 10 to 32 inches, black (10YR 2/1) mucky peat; weak, coarse, subangular blocky structure; very friable; moderately alkaline; calcareous; abrupt, wavy boundary.

IIC1—32 to 35 inches, dark-gray (5Y 4/1) marl; massive; friable; abundant snail shells; moderately alkaline; very highly calcareous; clear, wavy boundary.

IIC2—35 to 60 inches, gray (5Y 5/1) marl; massive; friable; abundant snail shells; moderately alkaline; very highly calcareous.

The color of the surface layer ranges from black (N 2/0) to very dark brown (10YR 2/2). The reaction varies from neutral to moderately alkaline. Depth to the underlying marl ranges from 12 to 42 inches.

The Rollin soils differ from the Ogden soils in being underlain by marl rather than clay. The shallow organic Adrian soils are underlain by sand at a depth of less than 42 inches.

Rollin muck (0 to 2 percent slopes) (Rt).—This soil is in depressions. Included with this soil in mapping are small areas of Houghton muck.

This soil is severely limited for crop use because it is underlain by marl at a depth of less than 42 inches and is difficult to drain. If drained, Rollin muck is subject to subsidence and soil blowing. The fertility in this soil is low. (Capability unit IVw–7; recreation group 8; wildlife group 9; urban trees group 9)

Rough broken land (Ry) is on steep escarpments and lakeshore bluffs along Lake Michigan and the major streams that drain into the lake. Along the lake the foot slopes of this land type border Sandy lake beaches. The upper slopes adjoin soils that, in most places, developed from glacial lake sediments. Landslides are frequent.

Rough broken land is generally composed of medium-textured soil material, but in places the texture is silty clay.

Steep slopes and serious erosion hazard severely limit use of this land for farming. (Capability unit VIIIs–10; recreation group 9; wildlife group 10; urban trees group 10)

St. Charles Series

In the St. Charles series are loamy, well drained and moderately well drained soils that developed in a silt mantle and the underlying outwash sand and gravel. These nearly level and gently sloping soils occupy terraces, mainly along the Fox River in the western part of the survey area. The native vegetation was hardwood forest.

In a typical profile the surface layer is neutral, dark-gray silt loam about 8 inches thick. The subsurface layer, about 3 inches thick, is slightly acid, brown silt loam.

The subsoil is about 37 inches thick. The upper part is neutral, brown and dark yellowish-brown silty clay loam. The lower part is neutral, dark-brown sandy clay loam.

The underlying material is highly calcareous, dark yellowish-brown medium to coarse sand and gravel that occur at a depth of 40 inches or more.

These soils have slow surface runoff, medium internal drainage, moderate permeability, and medium available moisture capacity. Their fertility is high. Roots easily penetrate to the sand and gravel.

Typical profile of St. Charles silt loam, gravelly substratum, 0 to 2 percent slopes, in an undisturbed area (SW¼SW¼ sec. 22, T. 1 N., R. 21 E., Kenosha County):

A1—0 to 8 inches, dark-gray (10YR 4/1) silt loam; weak, fine, granular structure; friable; neutral; clear, smooth boundary.

A2—8 to 11 inches, brown (10YR 5/3) silt loam; weak, thin, platy structure; very friable; slightly acid; clear, smooth boundary.

B1—11 to 15 inches, brown (10YR 4/3) silty clay loam; moderate, medium, subangular blocky structure; firm; neutral; clear, smooth boundary.

B21t—15 to 27 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; thick continuous clay films; neutral; clear, smooth boundary.

B22t—27 to 36 inches, dark-brown to brown (7.5YR 4/4) heavy silty clay loam; moderate, coarse, subangular blocky structure that breaks to moderate, medium, subangular blocky structure; firm; thick continuous clay films on ped faces; neutral; clear, smooth boundary.

IIB3—36 to 48 inches, dark-brown (7.5YR 3/2) sandy clay loam; weak, medium, subangular blocky structure; firm; neutral; clear, wavy boundary.

IIC—48 to 60 inches, dark yellowish-brown (10YR 4/4) medium to coarse sand and gravel; single grain; loose; highly calcareous.

The solum thickness ranges from 40 to 54 inches or more. The silt mantle is 30 to 50 inches thick. In cultivated areas the color of the surface layer is dark grayish brown (10YR 4/2) to brown (10YR 5/3). The upper part of the subsoil formed from silt and has a silt loam to heavy silty clay loam texture. The lower subsoil formed from outwash material and ranges from clay loam to gravelly loam in texture. The percentage of dolomite gravel in the underlying material is very high. The reaction of these soils is medium acid to neutral.

Depth to the sand and gravel underlying material is greater in the St. Charles soils than in the commonly associated Fox soils.

St. Charles silt loam, gravelly substratum, 0 to 2 percent slopes (SeA).—This soil lies on terraces. It commonly occurs with Fox soils. This soil has the profile described as typical for the series. Included with this soil in mapping are areas that exhibit mottling in the lower subsoil. Also included are small areas of Fox silt loam.

This is one of the best soils for farming in the survey area. It has very slight limitations for crop use. (Capability unit I–1; recreation group 1; wildlife group 1; urban trees group 1)

St. Charles silt loam, gravelly substratum, 2 to 6 percent slopes (SeB).—This soil occupies terraces and commonly occurs with the Fox soils. It has a thinner surface layer and subsoil than the soil described as typical for the series. Included with this soil in mapping are areas that are mottled in the lower subsoil. Also included are small areas of Fox silt loam.

The gentle slopes slightly limit the use of this soil for crops. (Capability unit IIe–1; recreation group 1; wildlife group 1; urban trees group 1)

Sandy and gravelly land (Sf) consists of filled and smoothed areas where the fill is mainly sand and gravel underlying material. This land type occurs mostly in the western third of the survey area. Gravelled parking lots that have been constructed at shopping centers and industrial sites also are classified as Sandy and gravelly land.

This land type is not suited to plant growth. (Capability unit VIIIs–10; recreation group 9; wildlife group 10; urban trees group 10)

Sandy lake beaches (Sfb) occur along the shores of Lake Michigan. These areas of washed sand and gravel may be partly inundated during storms or periods of high water level. South of the city of Kenosha, the beaches are bordered by Boyer, Sisson, and Granby soils, brown subsoil variant. North of the city of Kenosha to the Milwaukee County line, the beaches lie between a very steep lake bluff and the lake.

This land type has very rapid permeability and internal drainage. Its available moisture capacity is low. Because of the low fertility and flooding hazard, cropping is very severely limited. (Capability unit VIIIs–10; recreation group 9; wildlife group 10; urban trees group 10)

Sawmill Series, Calcareous Variant

The Sawmill series, calcareous variant, consists of poorly drained soils that developed in recently deposited loamy alluvium. These nearly level soils are on alluvial bottoms along the Fox and Root Rivers and commonly occur with Alluvial land and Wet alluvial land. The native vegetation was water-tolerant grasses and shrubs.

In a typical profile the surface layer is weakly calcareous, black silt loam about 8 inches thick. The subsurface layer is calcareous, black silt loam about 18 inches thick.

The subsoil is calcareous, dark-gray silty clay loam that contains many yellowish-brown mottles. It is 3 inches thick.

The upper 7 inches of the underlying material is calcareous, dark-gray gritty silty clay loam. It is mottled with dark brown to brown, strong brown, and yellowish brown. The lower part of the underlying material is highly calcareous, gray loam marked with many yellowish-brown mottles.

These soils have very high available moisture capacity, ponded to very slow surface runoff, moderately slow permeability, and very slow internal drainage. The tilth of these soils is good, and their fertility is high. Roots penetrate to the water table, which, seasonally, is less than 1 foot from the soil surface.

Typical profile of Sawmill silt loam, calcareous variant, in an undisturbed area (NE¼NE¼ sec. 10, T. 4 N., R. 22 E., Racine County):

A11—0 to 8 inches, black (10YR 2/1) silt loam; moderate, very fine, subangular blocky structure that breaks to moderate, medium, granular structure; friable; weakly calcareous; clear, smooth boundary.

A12—8 to 26 inches, black (10YR 2/1) silt loam; moderate, fine, subangular blocky structure that breaks to moderate, medium, granular structure; friable; calcareous; clear, smooth boundary.

B2g—26 to 29 inches, dark-gray (10YR 4/1) silty clay loam; moderate, medium, subangular blocky structure; firm; many, fine, distinct mottles of yellowish brown (10YR 5/6–5/8); patchy clay films on peds; calcareous; clear, smooth boundary.

C1g—29 to 36 inches, dark-gray (5Y 4/1) gritty silty clay loam; moderate, fine and medium, subangular blocky structure; firm; many, medium, distinct mottles of dark brown to brown (7.5YR 4/4), strong brown (7.5YR 4/6), and yellowish brown (10YR 5/8); calcareous; clear, smooth boundary.

C2g—36 to 45 inches, gray (5Y 5/1) loam; massive; firm; many, coarse, prominent mottles of yellowish brown (10YR 5/8); highly calcareous.

The A horizon ranges from 20 to 40 inches in thickness and from silt loam to silty clay loam in texture. The underlying material has a loam, silt loam, or silty clay loam texture. In many areas there are layers of gravel, gravelly loam, loamy sand, and sandy loam at a depth of 40 inches or more.

The Sawmill soils are much less variable in texture than Alluvial land and Wet alluvial land. This calcareous variant of the Sawmill series differs from normal Sawmill soils in being calcareous throughout the profile.

Sawmill silt loam, calcareous variant (0 to 2 percent slopes) (Sg).—This soil lies on alluvial bottoms along the Fox and Root Rivers. Included with it in mapping are small areas of Lawson silt loam, calcareous variant, and Wet alluvial land. Also included are small areas having slopes of more than 2 percent.

It is seldom feasible to drain this soil and protect it from overflow, but only slight limitations affect use of the soil for pasture. (Capability unit Vw–14; recreation group 6; wildlife group 8; urban trees group 8)

Saylesville Series

The Saylesville series is made up of well drained or moderately well drained soils that developed from laminated lacustrine silty clay loam, silty clay, and clay. These nearly level to moderately steep soils occupy flats, ridges, and knobs. The native vegetation consisted of hardwood forest.

In a typical profile the surface layer is slightly acid, dark grayish-brown silt loam about 8 inches thick.

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The subsoil is about 20 inches thick. The upper part is slightly acid, dark yellowish-brown silty clay loam. The next layer is neutral, dark-brown to brown silty clay. The lower part is neutral, strong-brown silty clay loam.

The underlying material is calcareous, yellowish-brown, stratified silty clay loam and silty clay.

These soils have high available moisture capacity, slow permeability, and medium internal drainage. Maintaining good tilth is sometimes difficult in moderately eroded areas. Roots readily penetrate to a depth of 5 feet or more. The fertility in these soils is high.

Typical profile of Saylesville silt loam, 0 to 2 percent slopes, in a cultivated area (NW¼NE¼ sec. 8, T. 3 N., R. 19 E., Racine County):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; very friable; slightly acid; abrupt, smooth boundary.

B1t—8 to 14 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; slightly acid; clear, smooth boundary.

B21t—14 to 19 inches, dark-brown to brown (7.5YR 4/4) silty clay; moderate, medium, subangular blocky structure; firm; patchy clay films on peds; neutral; clear, smooth boundary.

B22t—19 to 23 inches, dark-brown to brown (7.5YR 4/4) heavy silty clay; moderate, medium, subangular blocky structure; very firm; prominent clay films on peds; neutral; clear, smooth boundary.

B3—23 to 28 inches, strong-brown (7.5YR 5/6) silty clay loam; medium, moderate, subangular blocky structure; firm; neutral; clear, smooth boundary.

C—28 to 60 inches, yellowish-brown (10YR 5/6) laminated silty clay loam and silty clay; massive; very firm; calcareous.

The surface layer is dominantly silt loam, but it is loam in areas where a thin layer of outwash overlies the lacustrine sediments. In undisturbed areas the surface layer is less than 6 inches thick and is very dark grayish brown (10YR 3/2) or darker. The texture of the subsoil ranges from clay loam to clay. Depth to the underlying material ranges from 24 to 36 inches. The underlying material is mainly laminated silty clay loam, silty clay, and clay, but in some areas it includes layers of loamy and sandy material at a depth of 40 inches or more.

The Saylesville soils differ from the Zurich soils in having developed from finer textured lacustrine deposits. The normal Saylesville soils resemble the Saylesville soils, dark surface variant, in texture and drainage characteristics but have a thinner and a lighter colored surface layer.

Saylesville silt loam, 0 to 2 percent slopes (ShA).—This soil occupies flats in lake-laid areas. It has the profile described as typical for the series. Included with this soil in mapping are small areas of Saylesville soils, dark surface variant.

This soil is slightly limited for crop use. Deep plowing commonly mixes the upper part of the clayey subsoil with the surface layer. As a result, hard clods and lumps are formed if the soil is worked when wet. (Capability unit IIs–7; recreation group 3; wildlife group 1; urban trees group 2)

Saylesville silt loam, 2 to 6 percent slopes (ShB).—This soil lies on low ridges and islands in lake-laid areas. Slopes are convex and generally less than 300 feet in length. The surface layer and subsoil are thinner than those of the soil described as typical for the series. Included with this soil in mapping are small moderately

eroded areas. Also included are areas that have a loam surface soil.

Gentle slopes slightly limit this soil for cropping. Tillage mixes the clayey upper subsoil with the plow layer and in places results in less favorable tilth. (Capability unit IIe–6; recreation group 3; wildlife group 1; urban trees group 2)

Saylesville silt loam, 6 to 12 percent slopes, eroded (ShC2).—This soil occupies low ridges and islands in lake-laid areas. Slopes are convex and generally less than 300 feet in length. The surface layer and subsoil are thinner than those of the soil described as typical for the series. In addition, the surface layer is lighter in color than typical. Slightly eroded areas are included with this soil in mapping. Also included are small areas where the slope is greater than 12 percent. In places the underlying material contains 2- to 6-inch layers of sand or loamy material.

Because of the slopes and resulting erosion hazard, this soil is moderately limited for crop use. Tillage has mixed the upper part of the clayey subsoil with the plow layer. Hard clods and lumps form if the soil is tilled when wet. (Capability unit IIIe–6; recreation group 3; wildlife group 1; urban trees group 2)

Saylesville Series, Dark Surface Variant

In the Saylesville series, dark surface variant, are well drained or moderately well drained soils that developed from laminated lacustrine silty clay loam, silty clay, and clay. These nearly level to gently sloping soils occur on flats, low ridges, and knobs. The native vegetation consisted of prairie grasses.

In a typical profile the surface layer is medium acid to slightly acid, black to very dark gray silt loam about 9 inches thick. It is underlain by an upper subsurface layer, about 6 inches thick, of medium acid to slightly acid, black silt loam. Just below is a lower subsurface layer that is about 2 inches thick and is medium acid to slightly acid, very dark brown silty clay loam.

The subsoil is about 11 inches thick. The upper part is medium acid, dark-brown to brown silty clay to clay. The lower subsoil is medium acid to slightly acid, very dark gray and dark-brown to brown clay loam marked with a few mottles of yellowish brown.

The underlying material is calcareous, dark grayish-brown silty clay grading to silty clay loam. Dark yellowish-brown mottles are common in the upper 5 inches of this material.

These soils have high available moisture capacity, slow surface runoff, slow permeability, and medium internal drainage. The tilth of these soils is good, and their fertility is high. Roots readily penetrate to a depth of 5 feet or more.

Typical profile of Saylesville silt loam, dark surface variant, 0 to 2 percent slopes, in a cultivated field (NW¼SW¼ sec. 1, T. 1 N., R. 19 E., Kenosha County):

Ap—0 to 9 inches, black (10YR 2/1) and very dark gray (10YR 3/1) silt loam; moderate, medium, granular structure; very friable; medium to slightly acid; abrupt, smooth boundary.

A1—9 to 15 inches, black (10YR 2/1) silt loam; moderate, fine, subangular blocky structure; friable; medium to slightly acid; clear, smooth boundary.

A3—15 to 17 inches, very dark brown (10YR 2/2) silty clay loam; moderate, fine, subangular blocky structure; firm; medium to slightly acid; clear, smooth boundary.

B21t—17 to 23 inches, dark-brown to brown (10YR 4/3) silty clay to clay; moderate to strong, fine, subangular blocky structure; very firm; patchy clay films on peds; black (10YR 2/1) and very dark brown (10YR 2/2) organic stains; medium acid; clear, smooth boundary.

B22t—23 to 27 inches, dark-brown to brown (10YR 4/3) silty clay to clay; moderate to strong, medium, subangular blocky structure; very firm; patchy clay films on peds; black (10YR 2/1) organic stains; medium acid; clear, smooth boundary.

B3—27 to 28 inches, very dark gray (10YR 3/1) and dark-brown to brown (10YR 4/3) clay loam; weak, medium, subangular blocky structure; firm; few, faint mottles of yellowish brown (10YR 5/4); medium to slightly acid; clear, smooth boundary.

C1—28 to 33 inches, dark grayish-brown (10YR 4/2) silty clay; massive to weak, medium, subangular blocky structure; firm; common, fine, distinct mottles of dark yellowish brown (10YR 4/4); calcareous; clear, smooth boundary.

C2—33 to 60 inches, dark grayish-brown (10YR 4/2) silty clay loam; massive to weak, medium, subangular blocky structure; firm; calcareous.

The surface layer is dominantly silt loam, but it is loam in areas where a thin layer of outwash overlies the lacustrine sediments. The texture of the subsoil ranges from clay loam to clay. The depth to the underlying material ranges from 24 to 36 inches. The underlying material is mainly laminated silty clay loam and silty clay, but in some areas it includes thin layers of loamy and sandy material at depths of 40 inches or more.

The Saylesville soils, dark surface variant, resemble normal Saylesville soils in texture and drainage characteristics, but they have a thicker and darker colored surface layer. These dark surface variant soils have a finer textured profile than the Zurich or Sisson soils.

Saylesville silt loam, dark surface variant, 0 to 2 percent slopes (SkA).—This soil occupies lake-laid areas. It has the profile described as typical for the Saylesville series, dark surface variant. Included with this soil in mapping are small areas of Martinton silt loam and Saylesville silt loam.

This soil is slightly limited for crop use. Deep plowing commonly mixes some of the clayey upper subsoil into the plow layer, and this impairs tilth. (Capability unit IIs–7; recreation group 3; wildlife group 11; urban trees group 2)

Saylesville silt loam, dark surface variant, 2 to 6 percent slopes (SkB).—This soil occurs on low ridges and knobs in lake-laid areas. It has a thicker surface layer and subsoil but contains less mottling than the soil described in the typical profile. Included with this soil in mapping are areas of Martinton silt loam and Saylesville silt loam. Also included are some moderately eroded areas.

This soil is slightly limited for crop use because it is difficult to keep in good tilth. Tillage has mixed some of the clayey upper subsoil with the plow layer. (Capability unit IIe–6; recreation group 3; wildlife group 11; urban trees group 2)

Sebewa Series

The Sebewa series consists of poorly drained to very poorly drained, loamy soils that are underlain by outwash sand and gravel. These nearly level soils occupy

flats, depressions, and drainageways of high terraces. They occur near the major streams in the survey area. The native vegetation was water-tolerant grasses and shrubs.

In a typical profile the surface layer is mildly alkaline, black gritty silt loam about 8 inches thick. The subsurface layer, about 3 inches thick, is mildly alkaline, very dark brown gritty silt loam.

The subsoil is about 19 inches thick. The upper part is mildly alkaline, grayish-brown clay loam marked with many yellowish-brown mottles. The lower part is moderately alkaline, dark-gray light clay loam in which yellowish-brown mottles are common.

The underlying material is calcareous, grayish-brown, loose sand and gravel.

These soils have moderate permeability, very slow internal drainage, and medium available moisture capacity. Surface runoff is very slow to ponded. The fertility in these soils is moderate. Plant roots easily penetrate to the water table or, if the soils are drained, to the underlying sand and gravel.

Typical profile of Sebewa silt loam in a cultivated field (SE¼NE¼ sec. 10, T. 3 N., R. 19 E., Racine County):

Ap—0 to 8 inches, black (10YR 2/1) gritty silt loam; weak, medium, granular structure; friable; mildly alkaline; abrupt, wavy boundary.

A1—8 to 11 inches, very dark brown (10YR 2/2) gritty silt loam; weak, medium, subangular blocky structure; friable; mildly alkaline; clear, wavy boundary.

B1tg—11 to 19 inches, grayish-brown (2.5Y 5/2) clay loam; weak, medium, prismatic structure that breaks to moderate, medium, angular blocky structure; firm; many, fine, distinct mottles of yellowish brown (10YR 5/6–5/8); few patchy clay films; mildly alkaline; clear, wavy boundary.

B2tg—19 to 30 inches, dark-gray (5Y 4/1) light clay loam; weak, medium, prismatic structure that breaks to moderate, medium, angular blocky structure; firm; common, fine, distinct mottles of yellowish brown (10YR 5/6–5/8); few patchy clay films; moderately alkaline; abrupt, wavy boundary.

C—30 to 48 inches, grayish-brown (2.5Y 5/2) sand and gravel; single grain; loose; calcareous.

The solum ranges from 24 to 40 inches in thickness. The A horizon is 10 to 16 inches thick and, in places, is covered by a thin layer of organic material. The silt mantle ranges from 0 to 20 inches in thickness. Where part of the B horizon developed from silt, the texture is heavy silt loam to silty clay loam. Where the B horizon developed from sand and gravel, it has a clay loam to gravelly loam texture. Mottling in this horizon is less apparent where the water table is at or near the surface most of the time. The solum is neutral to moderately alkaline.

The Sebewa soils differ from the Fox soils in being poorly to very poorly drained rather than well drained, and they have a darker and thicker surface layer than those soils. The somewhat poorly drained Matherton soils lack the gray colors that are in the subsoil and underlying material of Sebewa soils.

Sebewa silt loam (0 to 2 percent slopes) (Sm).—This soil occupies flats, depressions, and drainageways. It has the profile described as typical for the series. Included with this soil in mapping are small areas that have a loam surface soil. Also included are areas that have clay layers at a depth of 40 inches or more.

If drained, this soil has only slight limitations that affect its use for cropping. (Capability unit IIw–5; recreation group 6; wildlife group 5; urban trees group 6)

Sebewa silt loam, clayey substratum (0 to 2 percent slopes) (So).—This soil occupies flats, depressions, and drainageways. In most respects this soil is similar to the soil described in the typical profile, but it is underlain at a depth of 40 to 60 inches by clayey lake-laid sediments or glacial till. The clayey material has a silty clay loam to clay texture. Included with this soil in mapping are small areas of Sebewa loam and Sebewa silt loam. Also included are some areas that have layers of silt and fine sand in the underlying material.

If drained, this soil has slight limitations affecting its use for crops. (Capability unit IIw–5; recreation group 6; wildlife group 5; urban trees group 6)

Sisson Series

The Sisson series is made up of loamy, well-drained soils that developed in laminated lacustrine silt, very fine sand, and fine sand. These nearly level to gently sloping soils occur on flats and low ridges. The native vegetation was hardwood forest.

In a typical profile the surface layer is neutral, dark grayish-brown fine sandy loam about 8 inches thick.

The subsoil is 23 inches thick. The upper part is neutral, yellowish-brown heavy loam. It is underlain by neutral, dark-brown to brown clay loam and silty clay loam. The lower subsoil is mildly alkaline, yellowish-brown sandy clay loam.

The upper 7 inches of the underlying material is calcareous, light yellowish-brown silt. It is underlain by calcareous, brownish-yellow, stratified silt, fine sand, and very fine sand.

These soils have high available moisture capacity, slow surface runoff, moderate permeability, and medium internal drainage. The tilth of these soils is good, and their fertility is moderate. Roots readily penetrate to a depth of 5 feet or more.

Typical profile of Sisson fine sandy loam, 1 to 6 percent slopes, in a cultivated field (SE¼NW¼ sec. 28, T. 1 N., R. 22 E., Kenosha County):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, fine, granular structure; very friable; neutral; abrupt, smooth boundary.

B1—8 to 13 inches, yellowish-brown (10YR 5/4) heavy loam; weak, medium, subangular blocky structure; friable; a few, very dark grayish-brown (10YR 3/2) worm casts; neutral; clear, smooth boundary.

B21t—13 to 21 inches, dark-brown to brown (7.5YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm; patchy clay films on peds; neutral; clear, smooth boundary.

B22t—21 to 26 inches, dark-brown to brown (7.5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; thick continuous clay films on peds; neutral; clear, smooth boundary.

B3t—26 to 31 inches, yellowish-brown (10YR 5/4) sandy clay loam; weak, medium, subangular blocky structure; firm; mildly alkaline; clear, smooth boundary.

C1—31 to 38 inches, light yellowish-brown (10YR 6/4) silt; massive; friable; calcareous; clear, smooth boundary.

C2—38 to 60 inches, brownish-yellow (10YR 6/6) laminated silt, fine sand, and very fine sand; massive and single grain; friable to loose; calcareous.

In undisturbed areas the surface layer is less than 6 inches thick. The color of the surface soil is very dark grayish brown (10YR 3/2) or darker. The texture of the subsoil ranges from loam to silty clay loam. The depth to the

underlying material ranges from 24 to 42 inches. This material is mainly laminated silt, very fine sand, and fine sand, but in some areas it includes layers of loamy and clayey material at a depth of 40 inches or more.

The Sisson soils resemble the Zurich soil in drainage characteristics, but they have coarser textured layers in their subsoil.

Sisson fine sandy loam, 1 to 6 percent slopes (SrB).—This soil occupies flats and low ridges in lake-laid areas. This soil has the profile described as typical for the series. Included in mapping are areas having 2- to 6-inch layers of medium or coarse sand in the underlying material. Some small inclusions have sandy profiles that lack the clay loam to silty clay loam subsoil typical of the Sisson soils.

Because of gentle slopes and the resulting erosion hazard, this soil has slight limitations for crop use. (Capability unit IIe–1; recreation group 2; wildlife group 1; urban trees group 3)

Sisson fine sandy loam, clayey substratum, 1 to 6 percent slopes (SsB).—This soil occupies flats and low ridges in lake-laid areas. This soil differs from the soil described as typical for the series in having clayey material at a depth of 42 inches or more. The material ranges from clay loam to clay in texture. Included with this soil in mapping are small areas of Sisson fine sandy loam. Also included are some small areas that have a sandy profile instead of the clay loam to silty clay loam subsoil that is typical of Sisson soils.

Because of gentle slopes and the resulting erosion hazard, this soil is slightly limited in its use for cropping. (Capability unit IIe–1; recreation group 2; wildlife group 1; urban trees group 3)

Symerton Series

In the Symerton series are loamy, well-drained soils that developed from outwash material underlain by laminated lacustrine silt and clay or clayey glacial till. These nearly level and gently sloping soils occupy flats, ridges, knobs, and foot slopes. The native vegetation was prairie grasses.

In a typical profile the surface layer is mildly alkaline, black loam about 10 inches thick. The subsurface layer, about 5 inches thick, is mildly alkaline, very dark grayish-brown loam.

The subsoil is about 23 inches thick. The upper part is slightly acid to neutral, dark yellowish-brown loam. Underlying this is medium acid, dark-brown to brown heavy loam. The lower subsoil is medium acid to slightly acid, dark grayish-brown clay loam to silty clay loam that is marked with common yellowish-brown mottles.

The underlying material is highly calcareous, grayish-brown silty clay loam.

These soils have high available moisture capacity, medium surface runoff, slow permeability, and medium internal drainage. The tilth of these soils is good, and their fertility is high. Roots readily penetrate to a depth of 5 feet or more.

Typical profile of Symerton loam, 2 to 6 percent slopes, in an undisturbed area (NE¼SE¼ sec. 9, T. 3 N., R. 21 E., Racine County):

A1—0 to 10 inches, black (10YR 2/1) loam; strong, medium, granular structure; very friable; mildly alkaline; clear, smooth boundary.

A3—10 to 15 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium, granular structure; very friable; mildly alkaline; clear, smooth boundary.

B1—15 to 19 inches, dark yellowish-brown (10YR 3/4) loam; moderate, fine, subangular blocky structure that breaks to moderate, fine, granular structure; firm; slightly acid to neutral; clear, smooth boundary.

B21t—19 to 25 inches, dark-brown to brown (10YR 4/3) heavy loam; moderate, fine, subangular blocky structure that breaks to moderate, fine, granular structure; firm; patchy clay films on peds; medium acid; clear, smooth boundary.

B22t—25 to 33 inches, dark-brown to brown (10YR 4/3) heavy loam; moderate, medium, subangular blocky structure that breaks to moderate, fine, subangular blocky structure; very firm; patchy clay films on peds; few, fine, distinct mottles of yellowish brown (10YR 5/6); medium acid; clear, smooth boundary.

IIB3t—33 to 38 inches, dark grayish-brown (10YR 4/2) clay loam to silty clay loam; moderate, fine, subangular structure that breaks to weak, medium, platy structures; firm; patchy clay films on peds; common, medium, distinct mottles of yellowish brown (10YR 5/6); medium acid to slightly acid; clear, smooth boundary.

IIC1—38 to 43 inches, dark grayish-brown and grayish-brown (10YR 4/2–5/2) silty clay loam; moderate, fine, prismatic structure; firm; calcareous; clear, smooth boundary.

IIC2—43 to 60 inches, grayish-brown (10YR 5/2) silty clay loam; massive; firm; highly calcareous.

Generally, contact between the outwash and the lacustrine material occurs in the lower subsoil. In some areas as much as 6 inches of leached outwash sand and gravel occurs between the solum and underlying clayey material. The thickness of the solum ranges from 24 to 40 inches. Where the underlying clayey material is glacial till, textures range from clay loam to silty clay. In some areas clayey lacustrine deposits include thin layers of very fine sand and fine sand below a depth of 40 inches.

The Symerton soils resemble Saylesville soils, dark surface variant, in color characteristics, but they have coarser textured upper subsoil horizons that developed from outwash material rather than for lacustrine silt and clay.

Symerton loam, 0 to 2 percent slopes (SzA).—This soil occupies flats in lake-laid areas. It differs from the soil described as typical for the series in having a thicker surface layer and a thicker subsoil. Included with this soil in mapping are small areas where the surface layer is silt loam.

This soil has slight limitations for cropping because plant roots do not readily penetrate the clayey lake-laid material or glacial till that occurs in the lower part of the subsoil or the upper part of the underlying material. (Capability unit IIs–7; recreation group 2; wildlife group 11; urban trees group 1)

Symerton loam, 2 to 6 percent slopes (SzB).—This soil occupies low ridges, knobs, and foot slopes in lake-laid areas. Slopes are generally less than 300 feet in length. This soil has the profile described as typical for the series. Included in mapping are small areas that have silt loam surface soil or that are moderately eroded.

Because of gentle slopes, this soil has slight limitations for cropping. Clayey material in the lower part of the subsoil or upper part of the underlying material some-

what restricts root penetration. (Capability unit IIe–6; recreation group 2; wildlife group 11; urban trees group 1)

Theresa Series

The Theresa series consists of well-drained, loamy soils that developed in a silt mantle and the underlying gravelly loam glacial till that is high in content of carbonates. These gently sloping soils occupy low ridges and knobs and occur in Waterford Township, Racine County. The native vegetation was hardwood trees.

In a typical profile the surface layer is neutral, dark grayish-brown silt loam about 7 inches thick. The subsurface layer, about 2 inches thick, is neutral, brown silt loam.

The subsoil is 19 inches thick. The upper layer is neutral, dark-brown to brown silty clay loam. It is underlain by neutral to slightly acid, dark brown to brown clay loam.

The underlying material is calcareous, brown to yellowish-brown gravelly loam. Limestone cobblestones are abundant in this material.

These soils have high available moisture capacity, medium surface runoff, moderate permeability, and medium internal drainage. Their fertility is moderate. Plant roots readily penetrate the gravelly loam glacial till to a depth of 5 feet or more.

Typical profile of Theresa silt loam, 2 to 6 percent slopes, in a cultivated area (SE¼SE¼ sec. 7, T. 4 N., R. 19 E., Racine County):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; very friable; neutral; clear, smooth boundary.

A2—7 to 9 inches, brown (10YR 5/3) silt loam; weak, medium, platy structure that breaks to weak, medium, granular structure; friable; neutral; clear, wavy boundary.

B1—9 to 15 inches, dark-brown to brown (7.5YR 4/4) silty clay loam; weak to moderate, fine, subangular blocky structure; firm; neutral; clear, wavy boundary.

IIB21t—15 to 18 inches, dark-brown to brown (7.5YR 4/4) clay loam; moderate, medium, angular blocky structure; very firm; dark-brown (7.5YR 3/2) clay films that are continuous and conspicuous; neutral to slightly acid; clear, wavy boundary.

IIB22t—18 to 22 inches, dark-brown to brown (7.5YR 4/4) heavy clay loam; moderate to strong, medium, angular blocky structure; very firm; dark-brown (7.5YR 3/2) clay films that are continuous and conspicuous; some very dark brown (10YR 2/2) organic stains on ped surfaces and in root channels; neutral; clear, wavy boundary.

IIB3t—22 to 28 inches, dark-brown to brown (7.5YR 4/4) clay loam; weak to moderate, medium, subangular blocky structure; firm; dark-brown (7.5YR 3/2) patchy clay films; few very dark brown (10YR 2/2) organic stains on ped surfaces; neutral; clear, irregular boundary.

IIC—28 to 54 inches +, brown to yellowish-brown (10YR 5/3–5/4) gravelly loam; massive; friable; abundant dolomitic cobblestones, mostly less than 5 inches in diameter; calcareous.

The solum ranges from 24 to 36 inches in thickness and is neutral to slightly acid. The silt mantle is 12 to 20 inches thick. The solum formed partly in the silt mantle but dominantly in glacial till. In undisturbed areas the surface layer is generally very dark brown to very dark grayish brown (10YR 2/2–3/2) and ranges from 4 to 6 inches in thickness. The color of the surface layer in cultivated areas varies with the degree of erosion. Small areas of severely and moderately eroded soils have a grayish-brown (10YR 5/2) to dark grayish-brown (10YR 4/2) color. Slightly eroded areas generally have a dark grayish-brown surface layer, but in places the color ranges to very dark grayish brown (10YR 3/2).

The Theresa soils have a thicker solum than the Hochheim soils, which occupy the more eroded and steeper areas that adjoin Theresa soils.

Theresa silt loam, 2 to 6 percent slopes (ThB).—This soil occupies crests of ridges and knobs in the gravelly loam glacial till area of Racine County. Slopes are convex and generally less than 300 feet in length. This soil commonly occurs with Hochheim loam or small areas of Hochheim silt loam. Included with this soil in mapping are small areas of nearly level Theresa silt loam or gently sloping Theresa silt loam that is moderately eroded.

Gentle slopes slightly limit the use of this soil for crops. (Capability unit IIe–1; recreation group 1; wildlife group 1; urban trees group 1)

Varna Series

The Varna series is made up of well drained or moderately well drained soils that developed in a thin silt mantle and the underlying clay loam to silty clay loam glacial till. These gently sloping to sloping soils occupy low ridges and knobs. The native vegetation was prairie grasses.

In a typical profile the surface layer is neutral, black silt loam about 14 inches thick. The subsurface layer, about 4 inches thick, is neutral, very dark grayish-brown silt loam (fig. 7).

The subsoil is about 14 inches thick and contains a few dolomite and shale fragments. The upper part is slightly acid, dark yellowish-brown silty clay. The lower part is calcareous, dark yellowish-brown heavy clay loam.

The underlying material is highly calcareous, yellowish-brown clay loam. Dolomite and shale fragments are abundant.

These soils have very high available moisture capacity, medium to rapid surface runoff, moderately slow permeability, and medium internal drainage. The tilth of these soils is good, and their fertility is high. Roots penetrate to a depth of 5 feet or more.

Typical profile of Varna silt loam, 2 to 6 percent slopes, in an undisturbed area (SE¼SW¼ sec. 34, T. 3 N., R. 22 E., Racine County):

A1—0 to 14 inches, black (10YR 2/1) silt loam; moderate to strong, medium, granular structure; very friable; neutral; clear, wavy boundary.

A3—14 to 18 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, subangular blocky structure that breaks to moderate, fine, granular structure; very friable; abundant worm casts; neutral; clear, irregular boundary.

IIB2t—18 to 30 inches, dark yellowish-brown (10YR 3/4) silty clay; moderate, fine and very fine, subangular blocky structure; firm; continuous clay films; some very dark grayish-brown (10YR 3/2) organic stains; a few dolomite and shale fragments, most of them less than 20 millimeters across; slightly acid; clear, wavy boundary.

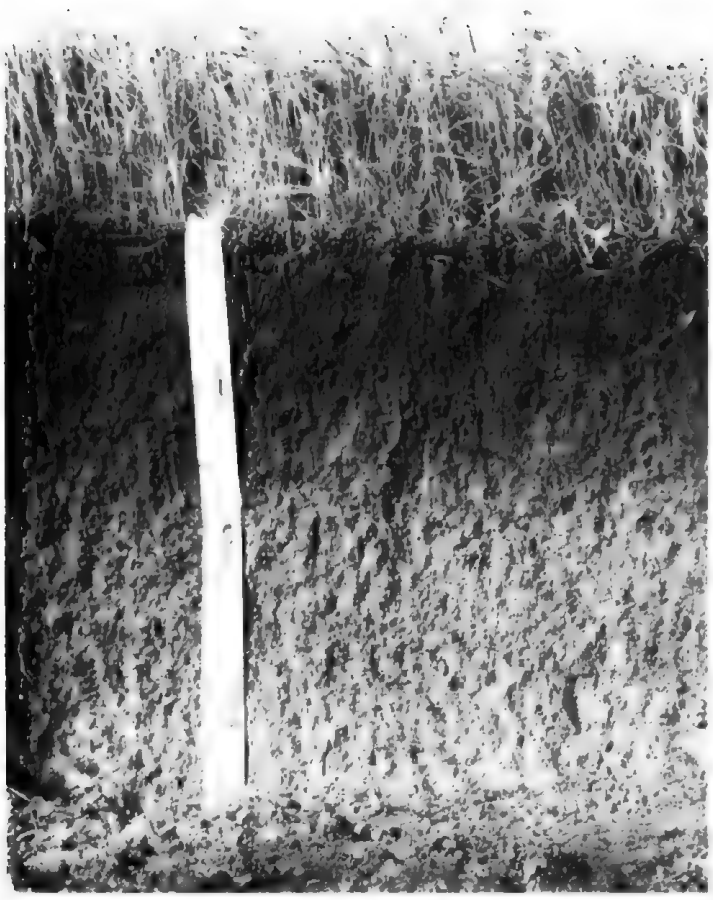

Figure 7.—Profile of a Varna silt loam.

IIB3t—30 to 32 inches, dark yellowish-brown (10YR 4/4) heavy clay loam; weak to moderate, medium, subangular blocky structure; very firm; patchy clay films; many very dark grayish-brown (10YR 3/2) organic stains; a few dolomite and shale fragments, most of them less than 20 millimeters across; calcareous; clear, irregular boundary.

IIC—32 to 54 inches +, yellowish-brown (10YR 5/4) clay loam; weak, coarse, subangular blocky structure becoming massive with depth; firm; abundant dolomite and shale fragments; highly calcareous.

The solum ranges from 24 to 36 inches in thickness and is slightly acid to moderately alkaline. The silt mantle ranges from 10 to 20 inches in thickness. The texture of the underlying material is clay loam, silty clay loam, or heavy silt loam. On lower slopes, a few, fine, faint mottles of brown (7.5YR 5/2) and strong brown (7.5YR 5/6) are in the lower part of the subsoil.

The Varna soils have a thicker and darker surface layer than the Morley soils.

Varna silt loam, 2 to 6 percent slopes (VaB).—This soil lies on low ridges and knobs in the clayey soil area of Kenosha and Racine Counties. Elliott silty clay loam commonly occupies drainageways that extend into areas of this soil. Slopes are convex and generally less than 400 feet in length. This soil has the profile described as typical for the series. Included with this soil in mapping are small areas of nearly level Varna silty clay loam.

Gentle slopes slightly limit the use of this soil for crops (fig. 8). (Capability unit IIe–6; recreation group 3; wildlife group 11; urban trees group 2)

Varna silt loam, 2 to 6 percent slopes, eroded (VaB2).—This soil occupies low ridges and knobs in the clayey soil area of Kenosha and Racine Counties. Elliott silty clay loam commonly is along drainageways that extend into areas of this soil. Slopes are convex and generally less than 300 feet in length. As much as two-thirds of the original surface layer of this soil has been lost through erosion. Consequently, the present surface layer, as well as the subsoil, is thinner than that described as typical for the series. In places there are small areas of slightly eroded Varna silt loam soil included with this soil.

Gentle slopes slightly limit this soil for cropping. The loss of surface soil results in unfavorable tilth and noticeably poorer growth of crops. If tilled when wet, this soil tends to form hard lumps or clods as it dries. (Capability unit IIe–6; recreation group 3; wildlife group 11; urban trees group 2)

Varna silt loam, 6 to 12 percent slopes, eroded (VaC2).—This soil lies on low ridges and knobs in the clayey soil area of Kenosha and Racine Counties. Slopes are convex and generally less than 300 feet in length. The somewhat poorly drained Elliott soils commonly occupy narrow drainageways that extend into areas of this soil. As much as two-thirds of the original surface layer of this soil has been lost through erosion. Therefore, the present surface layer and the subsoil are thinner than those in the soil described as typical for the series. Small areas of slightly eroded Varna silt loam are included in areas mapped as this soil.

Slopes and the resulting erosion hazard moderately limit use of this soil for crops. The loss of surface soil causes poor tilth and noticeably lower productivity. If tilled when wet, this soil dries into hard lumps or clods. (Capability unit IIIe–6; recreation group 3; wildlife group 11; urban trees group 2)

Wallkill Series

In the Wallkill series are nearly level soils that developed in loamy material recently deposited by water on

Figure 8.—A stand of alfalfa on Varna silt loam, 2 to 6 percent slopes. Farm pond in background is in an area of Elliott soils.

a very poorly drained organic soil. The loamy deposits were washed from nearby areas of Morley, McHenry, and Miami soils. The buried organic soil developed in the decomposed remains of grasses and sedges. Wallkill soils occupy small depressions and also adjoin large areas of organic soils. At lower elevations, they generally occur next to the Houghton soils. The Wallkill soils have formed since the survey area was settled and developed for farming.

In a typical profile the surface layer is mildly alkaline to moderately alkaline, black silt loam about 9 inches thick. The subsurface layer, about 15 inches thick, is neutral to mildly alkaline, black silt loam. The underlying material is neutral, black muck.

These soils have very high available moisture capacity. Their internal drainage is very slow or none. Tilth is good, and fertility is high. Roots penetrate to the water table.

Typical profile of Wallkill silt loam in a cultivated field (NE¼NE¼ sec. 1, T. 1 N., R. 19 E., Kenosha County):

Ap—0 to 9 inches, black (10YR 2/1) silt loam; weak, medium, subangular blocky structure that breaks to moderate, medium, granular structure; very friable; mildly to moderately alkaline; clear, wavy boundary.

A1—9 to 24 inches, black (10YR 2/1) silt loam; weak, medium, subangular blocky structure that breaks to moderate, fine, subangular blocky structure; friable; neutral to mildly alkaline; abrupt, wavy boundary.

II1b—24 to 30 inches, black (10YR 2/1) muck; fine to moderate, coarse, angular blocky structure; firm; neutral; clear, irregular boundary.

II2b—30 to 60 inches +, black (10YR 2/1) muck; massive; friable; neutral.

In places the surface layer is loam. The depth to the buried organic horizon ranges from 18 to 30 inches. The color of the surface layer ranges to very dark grayish brown (10YR 3/2). Typically, the solum is neutral to mildly alkaline.

Unlike the Wallkill soils, the Houghton soils lack surface hodizons formed in local alluvium.

Wallkill silt loam (0 to 2 percent slopes) (Wa).—This soil commonly occurs with Houghton muck. Nearly circular areas are in small depressions, and very narrow areas occupy wetland borders that adjoin eroded soils. Included with this soil in mapping are small areas of Worthen and Houghton soils. Also included are small areas of gently sloping Wallkill silt loam.

If protected from overflow, this soil has slight limitations for crop use. (Capability unit IIw–13; recreation group 7; wildlife group 8; urban trees group 8)

Warsaw Series

The Warsaw series consists of well-drained, loamy soils that are underlain by outwash sand and gravel. These nearly level and gently sloping soils occupy terraces in the vicinity of the major streams of the survey area. The native vegetation was prairie grasses.

In a typical profile the surface layer is neutral, black loam about 6 inches thick. The subsurface layer, about 4 inches thick, is slightly acid, very dark grayish-brown loam.

The subsoil is about 20 inches thick. The upper part is slightly acid, dark-brown to brown loam. It is underlain by neutral, dark-brown to brown sandy clay loam. The lower part is neutral, strong-brown loam.

The underlying material begins at a depth of 30 inches. It is calcareous, reddish-yellow medium sand that grades to highly calcareous, light yellowish-brown, stratified medium and coarse sand.

These soils have medium surface runoff, moderate permeability, and medium internal drainage. Their fertility and available moisture capacity are moderate. Plant roots easily penetrate to the underlying layers of sand or sand and gravel.

Typical profile of Warsaw loam, 2 to 6 percent slopes, in a cultivated field (SW¼NW¼ sec. 10, T. 3 N., R. 21 E., Racine County):

Ap—0 to 6 inches, black (10YR 2/1) loam; weak, fine, granular structure; very friable; neutral; clear, smooth boundary.

A3—6 to 10 inches, very dark grayish-brown (10YR 3/2) loam; weak, medium, granular structure; friable; slightly acid; clear, smooth boundary.

B1—10 to 14 inches, dark-brown to brown (7.5YR 4/4) loam; weak, fine, subangular blocky structure; friable; black (10YR 2/1) organic stains on ped faces; slightly acid; clear, smooth boundary.

B2—14 to 25 inches, dark-brown to brown (7.5YR 4/4) sandy clay loam; weak to moderate, medium, subangular blocky structure; friable; black (10YR 2/1) organic stains and patchy clay films on ped faces; neutral; clear, smooth boundary.

B3—25 to 30 inches, strong-brown (7.5YR 4/6) loam; weak to moderate, fine, subangular blocky structure; friable; neutral; clear, smooth boundary.

C1 30 to 40 inches, reddish-yellow (7.5YR 6/6) medium sand; single grain; loose; calcareous; clear, smooth boundary.

C2—40 to 60 inches, light yellowish-brown (10YR 6/4), stratified medium and coarse sand; single grain; loose; highly calcareous.

The thickness of the solum ranges from 24 to 40 inches. In some areas there is a silt mantle up to 20 inches thick. The surface layer is loam or silt loam. The part of the subsoil that developed from outwash material has textures that range from clay loam to gravelly loam. Where part of the subsoil developed in the silt mantle, the texture ranges from heavy silt loam to silty clay loam. The underlying material includes a variable quantity of gravel that is mainly dolomite. The solum is medium acid to neutral.

The surface layer of the Warsaw soils is darker in color and thinner than that of the Fox soils. The subsurface layer of Warsaw soils is very dark grayish brown, whereas the Fox soils have a brown subsurface layer.

Warsaw loam, 0 to 2 percent slopes (WeA).—This soil differs from the soil described as typical for the series because the surface layer is about 12 to 14 inches thick and the depth to sand and gravel is about 36 inches. Small areas of Matherton and Fox soils are included with this soil in mapping.

Runoff is very slow. The available moisture capacity is moderate. The soil is well suited to crops grown locally. (Capability unit IIs–1; recreation group 2; wildlife group 3; urban trees group 1)

Warsaw loam, 2 to 6 percent slopes (WeB).—This soil lies on terraces that are commonly bordered by Matherton soils. Drainageways occupied by Matherton soils extend into areas of this soil. This soil has the profile described as typical for the series. Included in mapping are small, moderately eroded areas and small areas having slopes of 0 to 2 percent. Small areas having a silt loam surface soil are also included.

This soil has slight limitations for crop use because of gentle slopes. Plant roots cannot readily penetrate the underlying material. (Capability unit IIe-2; recreation group 2; wildlife group 3; urban trees group 1)

Warsaw loam, clayey substratum, 0 to 2 percent slopes (WgA).—This soil occupies flats on terraces where the underlying material is clayey. It commonly occurs between Warsaw loam, clayey substratum, 2 to 6 percent slopes, on higher elevations and somewhat poorly drained Aztalan soils at lower elevations. This soil generally has a thicker surface layer and subsoil than the soil described as typical for the series. The clayey lower substratum, or underlying material, is at a depth of 40 to 60 inches. This material consists of clay loam to silty clay loam glacial till or silty clay loam to clay lake-laid sediments. Small areas of Warsaw loam, 0 to 2 percent slopes, and Aztalan soils are included with this soil in mapping.

This soil is slightly limited for crop use. (Capability unit IIs–1; recreation group 2; wildlife group 3; urban trees group 1)

Warsaw loam, clayey substratum, 2 to 6 percent slopes (WgB).—This soil occupies terraces. Slopes are commonly less than 200 feet in length. Warsaw loam, clayey substratum, 0 to 2 percent slopes, and Aztalan soils are generally at lower elevations. The surface layer and subsoil of this Warsaw soil are similar to those described as typical for the series. The clayey lower substratum, or underlying material, is at a depth of 40 inches or more. This material consists of clay loam to silty clay loam glacial till or silty clay loam to clay lake-laid sediments. Included with this soil in mapping are small areas of Warsaw loam, clayey substratum, 0 to 2 percent slopes; Aztalan soils; and other Warsaw soils. Also included are small areas of Warsaw loam having a loamy substratum at 40 inches or more.

This soil is slightly limited for crop use. (Capability unit IIe–2; recreation group 2; wildlife group 3; urban trees group 1)

Warsaw silt loam, 0 to 2 percent slopes (WhA).—This soil occupies flats on terraces. Areas are commonly bordered by gently sloping Warsaw soils or by Matherton soils in drainageways that extend into Warsaw soil areas. This soil generally has a slightly thicker surface layer and subsoil than the soil described as typical for the series. Its silt loam surface layer feels smooth when rubbed between the fingers, whereas the typical loam surface layer feels gritty. Included with this soil in mapping are small areas of Warsaw loam, 0 to 2 percent slopes, and Warsaw silt loam, 2 to 6 percent slopes. Also included are some areas that have mottling in the lower subsoil.

This soil is slightly limited for crop use because plant roots cannot readily penetrate the underlying material. (Capability unit IIs–1; recreation group 1; wildlife group 3; urban trees group 1)

Warsaw silt loam, 2 to 6 percent slopes (WhB).—This soil differs from the soil described as typical for the series because the surface layer is silt loam. Small areas of Fox and Matherton soils are included with this soil in mapping.

The use of this soil for crops is slightly limited. Runoff is slow, and the erosion hazard is slight. The available moisture capacity is moderate. (Capability unit IIe–2; recreation group 1; wildlife group 3; urban trees group 1)

Wasepi Series

The Wasepi series is made up of loamy, somewhat poorly drained soils that developed from stratified sandy outwash. These nearly level soils occupy flats, drainageways, and depressions. The native vegetation was prairie grasses and a sparse stand of hardwoods.

In a typical profile the surface layer is neutral, black sandy loam about 8 inches thick.

The subsoil, about 17 inches thick, is neutral and has gray mottles. The upper part is yellowish-brown sandy loam that is underlain by dark yellowish-brown loam. The lower subsoil is brownish-yellow loamy fine sand.

The underlying material is calcareous, light yellowish-brown medium sand.

These soils have medium available moisture capacity, slow surface runoff, moderate permeability, and slow internal drainage. The tilth of these soils is good, and their fertility is low. Roots can easily penetrate to the water table, which, seasonally, is less than 3 feet from the soil surface.

Typical profile of Wasepi sandy loam, 1 to 3 percent slopes, in a cultivated area (NW¼NE¼ sec. 30, T. 1 N., R. 23 E., Kenosha County):

Ap—0 to 8 inches, black (10YR 2/1) sandy loam; weak, fine, granular structure; very friable; neutral; abrupt, smooth boundary.

B1—8 to 13 inches, yellowish-brown (10YR 5/4) sandy loam; weak, medium, subangular blocky structure; very friable; common, medium, distinct mottles of gray (7.5YR 5/1); neutral; clear, smooth boundary.

B2t—13 to 20 inches, dark yellowish-brown (10YR 4/4) loam; moderate, medium, subangular blocky structure; friable; common, medium, distinct mottles of gray (10YR 5/1); neutral; clear, smooth boundary.

B3—20 to 25 inches, brownish-yellow (10YR 6/6) loamy fine sand; weak, fine, subangular blocky structure; very friable; many, medium, distinct mottles of gray (10YR 5/1); neutral; clear, smooth boundary.

C—25 to 60 inches, light yellowish-brown (10YR 6/4) medium sand; single grain; loose; calcareous.

The texture of the surface soil is dominantly sandy loam but in places ranges to loam. The texture of the subsoil ranges from loamy fine sand to sandy clay loam. The sandy clay loam part of the subsoil is generally less than 10 inches thick. Depth to the underlying material varies from 24 to 36 inches. The texture of this material generally is fine sand to coarse sand, but in some places it ranges from clay loam to clay.

The Wasepi soils have a sandy loam to sandy clay loam subsoil that is lacking in the Granby soils, brown subsoil variant. The Wasepi soils are coarser textured than the Darroch and Mundelein soils.

Wasepi sandy loam, 1 to 3 percent slopes (WmA).—This soil occupies flats, drainageways, and depressions. It has the profile described as typical for the series. Included with this soil in mapping are small areas of Wasepi sandy loam, clayey substratum, 1 to 3 percent slopes. Also included are small areas that have a loam surface layer.

If properly drained, this soil is moderately limited for crop use. Its low fertility and medium available moisture capacity also affect crop growth. (Capability unit

IIIw–5; recreation group 5; wildlife group 12; urban trees group 7)

Wasepi sandy loam, clayey substratum, 1 to 3 percent slopes (WnA).—This soil occurs on flats and in depressions. It differs from the soil described as typical for the series because the lower part of its underlying material is clayey. This material ranges in texture from clay loam to clay and occurs at a depth of 40 inches or more. Included with this soil in mapping are small areas of Wasepi sandy loam, 1 to 3 percent slopes. Also included are small areas where the subsoil ranges to a sandy loam or loamy sand in texture.

If properly drained, this soil is moderately limited for crop use. Its low fertility and medium available moisture capacity also affect crop growth. (Capability unit IIIw–5; recreation group 5; wildlife group 12; urban trees group 7)

Wet alluvial land (Ww) consists of poorly drained, unconsolidated alluvium that was recently deposited on low flood plains by stream overflow. The alluvial material generally is stratified and varies widely in texture and in color. This mapping unit commonly occurs with Alluvial land, Houghton muck, and Sawmill silt loam, calcareous variant. Small areas of these associated soils are included in areas mapped as Wet alluvial land.

This land has very slow internal drainage and variable fertility and available moisture capacity. Seasonally, the water table is less than 1 foot from the soil surface. Crop use is very severely limited because of wetness and frequent overflow. (Capability unit Vw–14; recreation group 7; wildlife group 8; urban trees group 8)

Worthen Series

In the Worthen series are moderately well drained, nearly level and very gently sloping soils that formed in loamy local alluvium recently deposited on an older developed soil. The loamy deposits were washed from adjoining areas of Morley, Fox, Casco, Miami, and McHenry soils. The Worthen soils occupy small depressions and drainageways that lie near these adjoining soils. The upper part of the Worthen soils has formed since the survey area was settled and developed for farming.

In a typical profile the surface layer is neutral, very dark brown silt loam about 24 inches thick. Underlying this is a layer of neutral, black to very dark brown silt loam about 8 inches thick. The lower subsurface layer is medium acid to slightly acid, dark grayish-brown silt loam about 2 inches thick.

The subsoil is about 24 inches thick. The upper part is medium acid, dark-brown to brown silty clay loam. It is underlain by medium acid, dark yellowish-brown silty clay loam that is mottled with yellowish brown. The lower subsoil is slightly acid to neutral, dark yellowish-brown clay loam.

The underlying material is mildly alkaline to moderately alkaline, dark yellowish-brown gravelly sandy loam.

These soils have high available moisture capacity, medium surface runoff, moderate permeability, and medium internal drainage. Their tilth is good, and their fertility is high. Plant roots readily penetrate to a depth of 5 feet or more.

Typical profile of Worthen silt loam, 0 to 3 percent slopes, in a cultivated field (NW¼SE¼ sec. 20, T. 1 N., R. 19 E., Kenosha County):

A11—0 to 14 inches, very dark brown (10YR 2/2) silt loam; weak, medium, granular structure; friable; neutral; clear, smooth boundary.

A12—14 to 24 inches, very dark brown (10YR 2/2) silt loam; weak, thick, platy structure that breaks to weak, medium, granular structure; friable; neutral; clear, smooth boundary.

A1b—24 to 32 inches, black (10YR 2/1) to very dark brown (10YR 2/2) silt loam; moderate, medium, granular structure; very friable; neutral; clear, smooth boundary.

A2b—32 to 34 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, platy structure that breaks to weak, fine, subangular blocky structure; friable; medium acid to slightly acid; clear, smooth boundary.

B1b—34 to 38 inches, dark-brown to brown (10YR 4/3) silty clay loam; weak, medium, subangular blocky structure; firm; grayish-brown (10YR 5/2) ped coatings; medium acid; clear, smooth boundary.

B21b—38 to 45 inches, dark yellowish-brown (10YR 4/4) heavy silty clay loam; weak to moderate, medium, subangular blocky structure; firm; grayish-brown (10YR 5/2) ped coatings; few, fine, faint mottles of yellowish brown (10YR 5/4–5/6); medium acid; clear, smooth boundary.

B22b—45 to 51 inches, dark yellowish-brown (10YR 4/4) heavy silty clay loam; weak to moderate, medium, subangular blocky structure; firm; grayish-brown (10YR 5/2) ped coatings; common, fine, distinct mottles of yellowish brown (10YR 5/6); patchy clay films on peds; medium acid; clear, smooth boundary.

B3b—51 to 58 inches, dark yellowish-brown (10YR 4/4) clay loam; weak to moderate, medium to coarse, subangular blocky structure; firm; slightly acid to neutral; clear, smooth boundary.

Cb—58 to 60 inches, dark yellowish-brown (10YR 4/4) gravelly sandy loam; single grain; loose; mildly alkaline to moderately alkaline.

The surface layer is mainly silt loam, but small areas of loam occur in places. The depth to the older developed soil profile ranges from 20 to 40 inches. Mottles are lacking in some areas. Differences in the source of sediments cause minor color variations in the local alluvial horizons. Typically, these soils are slightly acid to neutral.

The Worthen soils developed from the same kind of soil material as the somewhat poorly drained Radford soils, but the Worthen soils lack the dark mottles that are caused by somewhat poor drainage.

Worthen silt loam, 0 to 3 percent slopes (WyA).—This soil occupies depressions and narrow drainageways. Areas that occupy depressions are circular in shape, whereas those in drainageways are long and narrow. This soil is generally bordered by moderately eroded and severely eroded soils. Included with this soil in mapping are small areas of Radford silt loam.

This soil is very slightly limited for crop use. (Capability unit I–1; recreation group 5; wildlife group 8; urban trees group 8)

Yahara Series

The Yahara series consists of loamy, somewhat poorly drained soils that developed from laminated lacustrine silt, very fine sand, and fine sand. These nearly level soils occupy flats, drainageways, and depressions. The native vegetation consisted of hardwoods.

In a typical profile the surface layer is neutral, very dark grayish-brown fine sandy loam about 9 inches thick. The next layer, about 4 inches thick, is a layer of transition between the surface layer and subsoil. It is neutral, yellowish-brown fine sandy loam that contains many yellowish-brown mottles.

The subsoil is about 9 inches thick. The upper part is neutral, yellowish-brown fine sandy loam that is marked with many mottles of yellowish brown, strong brown, and grayish brown. The lower part is calcareous, yellowish-brown loamy fine sand that contains many mottles of yellowish brown and grayish brown.

The underlying material is highly calcareous, light yellowish-brown, stratified silt and very fine sand.

These soils have high available moisture capacity, slow surface runoff, moderate permeability, and slow internal drainage. The tilth of these soils is good, and their fertility is low. Roots penetrate to the water table, which, seasonally, is less than 3 feet below the soil surface.

Typical profile of Yahara fine sandy loam, 1 to 3 percent slopes, in a cultivated field (SW¼SW¼ sec. 27, T. 4 N., R. 23 E., Racine County):

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, coarse, subangular blocky structure that breaks to moderate, medium, granular structure; very friable; neutral; abrupt, smooth boundary.

AB—9 to 13 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, medium, subangular blocky structure; very friable; many, fine, distinct mottles of yellowish brown (10YR 5/6–5/8); neutral; clear, smooth boundary.

B2—13 to 20 inches, yellowish-brown (10YR 5/6) fine sandy loam; weak, medium, subangular blocky structure; very friable; many, medium, distinct mottles of yellowish brown (10YR 5/8), strong brown (7.5YR 5/8), and grayish brown (10YR 5/2); neutral; clear, smooth boundary.

B3—20 to 22 inches, yellowish-brown (10YR 5/4) loamy fine sand; weak, medium, subangular blocky structure; very friable; many, medium, distinct mottles of yellowish brown (10YR 5/8) and grayish brown (10YR 5/2); calcareous; clear, smooth boundary.

C—22 to 60 inches, light yellowish-brown (10YR 6/4), laminated silt and very fine sand; single grain and massive; loose and friable; highly calcareous.

The surface layer is dominantly fine sandy loam, but in places it ranges to loam. The texture of the subsoil varies from fine sand to very fine sandy loam. The depth to the underlying material ranges from 18 to 36 inches. This material is mainly laminated silt, very fine sand, and fine sand, but in some areas layers of loamy and clayey material occur below a depth of 40 inches.

The Yahara soils lack the very dark surface layer and the loam to silty clay loam subsoil of the Darroch and Mundelein soils.

Yahara fine sandy loam, 1 to 3 percent slopes (YaA).—This soil occupies flats, drainageways, and small depressions in lake-laid areas. Included with this soil in mapping are small areas of Granby fine sandy loam. Also included are small areas having a silt loam surface layer and small areas where the surface layer is lighter colored than typical.

If drained, this soil is slightly limited for crop use. (Capability unit IIIw–5; recreation group 5; wildlife group 2; urban trees group 6)

Zurich Series

The Zurich series is made up of loamy, well-drained soils that developed from laminated lacustrine silt, very fine sand, and fine sand. These nearly level to sloping soils occupy flats and low ridges. The native vegetation was hardwood forest.

In a typical profile the surface layer is mildly alkaline, dark grayish-brown silt loam about 6 inches thick. The subsurface laver, about 2 inches thick, is mildly alkaline, dark yellowish-brown light silt loam.

The subsoil is about 31 inches thick. The upper part is neutral, yellowish-brown heavy silt loam. The middle part is neutral, strong-brown silty clay loam to heavy silty clay loam. The lower subsoil is calcareous, strong-brown loam.

The underlying material is calcareous, reddish-yellow, stratified silt, very fine sand, and fine sand.

These soils have high available moisture capacity, medium surface runoff, moderate permeability, and medium internal drainage. They are in good tilth, and their fertility is moderate. Roots readily penetrate to a depth of 5 feet or more.

Typical profile of Zurich silt loam, 2 to 6 percent slopes, in a cultivated area (NW¼SE¼ sec. 2, T. 4 N., R. 22 E., Racine County):

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; very friable; mildly alkaline; abrupt, smooth boundary.

A2—6 to 8 inches, dark yellowish-brown (10YR 4/4) light silt loam; weak, thin, platy structure; very friable; mildly alkaline; clear, smooth boundary.

B1—8 to 18 inches, yellowish-brown (10YR 5/4) heavy silt loam; weak, fine, subangular blocky structure; friable; neutral; clear, smooth boundary.

B21t—18 to 31 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm; patchy clay films on peds; neutral; clear, smooth boundary.

B22t—31 to 35 inches, strong-brown (7.5YR 5/6) heavy silty clay loam; moderate, medium, subangular blocky structure; firm; complete clay films on peds; neutral; clear, smooth boundary.

B3—35 to 39 inches, strong-brown (7.5YR 4/6) loam; weak, medium, subangular blocky structure; friable; calcareous; clear, smooth boundary.

C1—39 to 42 inches, reddish-yellow (7.5YR 6/6) fine sand; single grain; loose; calcareous; clear, smooth boundary.

C2—42 to 45 inches, reddish-yellow (7.5YR 7/6) silt; massive; friable; calcareous; clear, smooth boundary.

C3 -45 to 60 inches, reddish-yellow (7.5YR 6/6), laminated silt, very fine sand, and fine sand; single grain and massive; loose and friable; calcareous.

In undisturbed areas the A1 horizon is less than 6 inches thick and is very dark grayish brown (10YR 3/2) or darker. The texture of the subsoil ranges from loam to silty clay. The depth to the underlying material ranges from 24 to 42 inches. Typically, this material consists of laminated silt, very fine sand, and fine sand. In some areas, however, layers of loamy and clayey material occur below 40 inches.

The Zurich soils have less sand in the subsoil than the Sisson soils. The Zurich soils developed from coarser textured lacustrine deposits than the Saylesville soils.

Zurich silt loam, 0 to 2 percent slopes (ZuA).—This soil occurs on flats. It has a thicker surface layer and subsoil than the soil described as typical for the series. Included with this soil in mapping are a few small areas

of moderately well drained soils that have mottling in the lower subsoil and underlying material. Also included are small areas having a loam or fine sandy loam surface layer.

This soil is very slightly limited for crop use. (Capability unit I–1; recreation group 1; wildlife group 1; urban trees group 1)

Zurich silt loam, 2 to 6 percent slopes (ZuB).—This soil lies on low ridges and islands surrounded by nearly level, somewhat poorly drained soils. Slopes are generally convex and less than 200 feet in length. This soil has the profile described as typical for the series. In some undisturbed areas the color of the surface layer ranges to very dark grayish brown. Included with this soil in mapping are small areas of moderately well drained soils that have mottling in the lower subsoil and underlying material. Also included are small areas of soils that have clay layers at a depth of 42 inches or more. Small inclusions having a loam or fine sandy loam surface layer occur in places.

The gentle slopes slightly limit this soil for crop use. (Capability unit IIe–1; recreation group 1; wildlife group 1; urban trees group 1)

Zurich silt loam, 6 to 12 percent slopes, eroded (ZuC2).—This soil occupies low ridges and islands in lake-laid areas. Slopes are convex and generally less than 200 feet in length. As much as two-thirds of the original surface layer of this soil has been lost through erosion. Consequently, the present surface layer and the subsoil are thinner than in the soil described as typical for the series. Included with this soil in mapping are small areas having a loam or fine sandy surface soil. Also included are some areas having slopes of 12 to 15 percent.

Because of slopes, this soil is moderately limited for crop use. (Capability unit IIIe–1; recreation group 1; wildlife group 1; urban trees group 1)

Formation and Classification of Soils

In this section the factors that affect the formation of soils in Kenosha and Racine Counties are discussed. Then, the current system of soil classification is explained and the soils are placed in higher categories. The soil series in the two counties, including a profile representative of each series, are described in the section "Descriptions of the Soils."

Formation of Soils

Soil is produced by the action of soil-forming processes on material deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by (1) the composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time the processes of soil development have acted on the soil material.

Climate and plant and animal life, particularly vegetation, are the active forces in soil formation. They act on the parent material and change it into a body having definite soil characteristics. All five factors come into play in the formation of every soil, but the relative importance of each factor varies from place to place. In some places one factor is dominant and fixes most of the properties of the soil. Normally, however, the interaction of all five factors determines the kind of soil that develops in any given place.

Most of the soils in Kenosha and Racine Counties were derived from material laid down by glaciers of Wisconsin age. The material covered all of the survey area except a small part of Randall Township in Kenosha County. In this small area, drift was deposited during an earlier glacial age.

Extending inland for a distance of 1 to 2 miles from present Lake Michigan is a low, nearly level plain that was covered by glacial Lake Chicago. The western edge of this plain is intermittently marked by low beach ridges consisting of sand and gravel. These ridges rise about 55 feet above the level of the present lake. In addition, there are slightly lower ridges that were formed as the glacial lake receded, and one such beachline appears as a wave-cut terrace that lies from 10 to 20 feet above the average level of the existing lake. The sandy drift deposited by glacial Lake Chicago was the parent material for soils of the Boyer, Casco, and Granby series and the Granby series, brown subsoil variant.

Between the glacial beach ridges and an imaginary line 1½ to 3 miles east of the Fox River, the survey area is covered with glacial drift that has a high content of clay. This clayey material likely was incorporated into the ice as the glacier advanced over deposits of clay and shale in the Lake Michigan basin to the north. Then, the material was carried to this area and was deposited when the glacial ice melted. Among the soils that formed in the clayey glacial drift are the Ashkum, Beecher, Blount, Markham, Morley, and Varna soils.

The western part of the two counties is covered with glacial drift made up of sand and gravel, and in places it is an area of irregular relief. The drift, deposited by streams flowing from glaciers, was the parent material for the Casco, Fox, Kane, Plano, and other soils. The Hochheim, McHenry, Miami, and Theresa soils formed in sandy and gravelly glacial drift that was mantled with wind-deposited silt, as much as 42 inches thick in some places.

Soils that formed mainly in lacustrine material laid down in glacial lakes include the Darroch, Montgomery, Pella, and Sisson. These soils occur throughout the areas of glacial till and glacial outwash in both counties.

Some soils in the survey area formed in organic material that accumulated in depressions. The Adrian, Houghton, Ogden, Palms, and Rollin soils formed in this kind of material. Some of the deeper depressions, especially those in the western part of the counties, now are marshes, ponds, or lakes.

The drainage characteristics of soils are determined mainly by relief or position in the landscape. Soils that formed in one kind of parent material but have different characteristics because of differences in degree of wetness make up a sequence called a drainage sequence. For example, the Morley, Blount, and Ashkum soils are members of a drainage sequence. The well drained or moderately well drained Morley soils are high lying and

gently sloping to steep. Generally, the somewhat poorly drained Blount soils occupy foot slopes, the borders of wet areas, and drainageways. These soils contain red and yellow mottles, which indicate poor aeration and excess moisture. The poorly drained Ashkum soils are nearly level and lie in broad drainageways and depressional areas. In most places these soils have a water table near the surface.

Time accounts for some of the differences among soils. The Worthen and Wallkill soils, for example, have been in place only long enough for the accumulation of organic matter in the surface layer and a slight change in color of the subsoil or leaching of some carbonates from the upper part of the profile. In contrast, soils developed from glacial drift have well-defined horizons that required thousands of years to form.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through the use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

Thus in classification, soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and used in managing farms, fields, and woodland; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and later revised (*5*). The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965. The current system is under continual study (*3*, *7*). Therefore, readers interested in developments of the current system should search the latest literature available. In table 9 the soil series of Kenosha and Racine Counties are placed in some categories of the current system.

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar origin are grouped together. The classes of the current system are briefly defined in the following paragraphs.

ORDERS. Ten soil orders are recognized. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate these soil orders are those that tend to give broad climatic groupings of soils. Two exceptions, the Entisols and Histosols, occur in many different kinds of climate. The five orders in Kenosha and Racine Counties are Alfisols, Entisols, Histosols, Inceptisols, and Mollisols.

Alfisols formed mostly under trees, but some have formed under grass. They are light colored and have a base saturation of more than 35 percent. The base saturation increases with increasing depth.

Entisols are mineral soils that have been only slightly modified from the geologic material in which they have been formed.

Histosols are highly organic soils, and their classification has not been completed beyond the order.

Inceptisols are mineral soils in which horizons have definitely started to develop. They generally are on young, but not recent, land surfaces.

Mollisols have formed mostly under grass. They have a thick, friable, dark-colored surface layer. Base saturation is more than 50 percent.

SUBORDERS. Each order is divided into groups (suborders) that are based mostly on soil characteristics that seem to produce classes having the greatest similarity from the standpoint of their genesis. Suborders narrow the broad climatic range of soils that are in the order.

Soil characteristics used to separate suborders mainly reflect either the presence or absence of waterlogging or soil differences produced through the effects of climate or vegetation. The names of suborders have two syllables, the last of which indicates the order. An example is Udalf (Ud, meaning humid, and alf, from Alfisol).

GREAT GROUPS. Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and other features. The horizons used as a basis for distinguishing between great groups are those in which (1) clay, iron, or humus have accumulated; (2) a pan has formed that interferes with growth of roots, movement of water, or both; or (3) a thick, dark-colored surface horizon has formed. The other features commonly used are the self-mulching properties of clay, temperature of the soil, major differences in chemical composition (mainly the bases calcium, magnesium, sodium, and potassium), or the dark-red or dark-brown colors associated with soils formed in material weathered from basic rocks.

Names of the great groups have three or four syllables. They are made by adding a prefix to the name of the suborder. An example is Hapludalfs (Hapl, meaning usual; ud, for humid; and alf, from Alfisol). The great group is not shown separately in table 9, because it is the last word in the name of the subgroup.

SUBGROUPS. Great soil groups are subdivided into subgroups. One of these represents the central, or typic, segment of the group. Other subgroups have properties of the group but have one or more properties of another great group, suborder, or order, and these are called intergrades. Also, subgroups may be established for soils having properties that intergrade outside the range of any other great group, subgroup, or order. The names of subgroups are formed by placing one or more adjectives before the name of the great group. An example is Typic Hapludalf.

TABLE 9.—*Soil series classified according to the current system of classification* [1]

Series	Family	Subgroup	Order
Adrian	(2)	(2)	Histosols
Ashkum	Fine, mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols
Aztalan	Fine-loamy, mixed, mesic	Aquic Argiudolls	Mollisols
Beecher	Fine, illitic, mesic	Udollic Ochraqualfs	Alfisols.
Blount	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Boyer	Coarse-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Casco	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Typic Hapludalfs	Alfisols.
Colwood	Fine-loamy, mixed, mesic	Typic Haplaquolls	Mollisols.
Conover	Fine loamy, mixed mesic	Aquollic Hapludalfs	Alfisols
Darroch, neutral variant	Fine-loamy, mixed, mesic	Aquic Argiudolls	Mollisols.
Dorchester	Fine-silty, mixed, calcareous, mesic	Typic Udifluvents	Entisols.
Dresden	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Mollic Hapludalfs	Alfisols.
Drummer	Fine-silty, mixed, nonacid, mesic	Typic Haplaquolls	Mollisols.
Elliott	Fine, illitic, mesic	Aquic Argiudolls	Mollisols.
Fabius	Fine-loamy over sandy or sandy-skeletal mixed, mesic	Aquic Argiudolls	Mollisols.
Fox	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Typic Hapludalfs	Alfisols.
Granby	Sandy, siliceous, noncalcareous, mesic	Typic Haplaquolls	Mollisols.
Granby, brown subsoil variant	Sandy, siliceous, mesic	Aquic Entic Hapludolls	Mollisols.
Griswold	Fine-loamy, mixed, mesic	Typic Argiudolls	Mollisols.
Hebron	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols
Hochheim	Fine-loamy, mixed, mesic	Typic Argiudolls	Mollisols.
Houghton	(2)	(2)	Histosols.
Kane	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Aquic Argiudolls	Mollisols.
Knowles	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols
Lawson, calcareous variant	Fine-silty, mixed, mesic	Aquic Cumulic Hapludolls	Mollisols.
Lorenzo	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Argiudolls	Mollisols
Markham	Fine, illitic, mesic	Mollic Hapludalfs	Alfisols.
Martinton	Fine, illitic, mesic	Aquic Argiudolls	Mollisols.
Matherton	Fine-loamy, over sandy or sandy-skeletal, mixed, mesic	Udollic Ochraqualfs	Alfisols.
McHenry	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Miami	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols
Montgomery	Fine-mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols.
Morley	Fine, illitic, mesic	Typic Hapludalfs	Alfisols.
Mundelein	Fine-silty, mixed, mesic	Aquic Argiudolls	Mollisols
Muskego	(2)	(2)	Histosols.
Mussey	Fine-loamy over sandy or sandy-skeletal, mixed, noncalcareous, mesic	Typic Argiaquolls	Mollisols.
Navan	Fine-loamy, mixed, noncalcareous, mesic	Typic Argiaquolls	Mollisols
Ogden	(2)	(2)	Histosols.
Palms	(2)	(2)	Histosols.
Pella	Fine-silty, mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols.
Plano	Fine-silty, mixed, mesic	Typic Argiudolls	Mollisols.
Radford	Fine-silty, mixed mesic	Aquic Fluventic Hapludolls	Mollisols
Ringwood	Fine silty, mixed, mesic	Typic Argiudolls	Mollisols.
Rodman	Sandy-skeletal, mixed, carbonatic, mesic	Eutrochreptic Rendolls	Mollisols.
Rollin	(2)	(2)	Histosols.
St. Charles	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols
Sawmill, calcareous variant	Fine-silty, mixed, calcareous, mesic	Cumulic Haplaquolls	Mollisols.
Saylesville	Fine, illitic, mesic	Typic Hapludalfs	Alfisols.
Saylesville, dark surface variant	Fine, illitic, mesic	Typic Argiudolls	Mollisols.
Sebewa	Fine-loamy over sandy or sandy-skeletal, mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols.
Sisson	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Symerton	Fine-loamy, mixed, mesic	Typic Argiudolls	Mollisols.
Theresa	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols
Varna	Fine, illitic, mesic	Typic Argiudolls	Mollisols.
Wallkill	Fine-silty, mixed, nonacid, mesic	Thapto Histic Haplaquepts	Inceptisols.
Warsaw	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Typic Argiudolls	Mollisols
Wasepi	Coarse-loamy, mixed, mesic	Aquollic Hapludalfs	Alfisols.
Worthen	Fine-silty, mixed, mesic	Cumulic Hapludolls	Mollisols.
Yahara	Coarse-loamy, mixed, mesic	Aquic Hapludolls	Mollisols.
Zurich	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.

[1] Placement of some soil series in the current system of classification, particularly in families, may change as more information becomes available.

[2] Families and subgroups have not been developed for the Histosols order.

FAMILIES. Families are separated within a subgroup, primarily on the basis of properties that are important to the growth of plants or to the behavior of soils used for engineering. The main properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. The names of families consist of a series of adjectives that precede the name of a subgroup. The adjectives used are the class names for soil texture, mineralogy, and so on (see table 9). An example is the coarse-loamy, mixed, mesic family of Typic Hapludalfs.

SERIES. The series consists of a group of soils that formed from a particular kind of parent material and that have genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile. Among these characteristics are color, structure, reaction, consistence, and mineralogical and chemical composition.

General Nature of the Area

This section provides general information about Kenosha and Racine Counties. It discusses climate, early settlement and development, farming, and other subjects of general interest.

Climate [3]

Table 10 gives climatic data representative of Kenosha and Racine Counties. The data were compiled from records of the U.S. Weather Bureau at Racine. This city is along Lake Michigan, where the temperature is cooler in summer and warmer in winter than it is away from the lake.

Also given in table 10 are temperatures in terms of degree days (*4*). The number of degree days is the difference between the average temperature for a given day and 65° F. It is a measure of the amount of heat needed to keep the temperature on a specific day at 65°. For example, on a day having an average temperature of 50°, 15 degree days would be counted. A knowledge of accumulated degree days for a stated time is helpful in calculating the amount of fuel needed for heating buildings and for determining the rate of growth and the maturity date of crops.

Kenosha and Racine Counties have a continental climate, modified somewhat by Lake Michigan. The effects of the lake are most pronounced in spring and early in summer, when the prevailing northeasterly wind is off the lake. The effects are least in winter, when the prevailing wind is westerly. The area also is influenced by high and low pressure systems moving eastward across the continent and by low pressure systems moving northeastward from the southwestern states.

Winters in these counties are long, cold, and snowy. Streams and small lakes generally are frozen from early in December to late in March. Spring is slow in coming and consists of alternate warm and cold periods. Snowfall decreases, and by the end of March most precipitation falls as rain. Cool northeast winds blowing off Lake Michigan prevail. The summers are warm and normally include several short periods when the weather is hot and humid. Cool periods are likely to occur any month of the summer. Dew forms on most summer mornings, and often it is heavy. Nearly every fall has one or more periods of Indian summer, when the days are abnormally warm, the sky is cloudless but hazy, and the nights are cool. In fall the temperature at night generally is somewhat warmer near the lake than it is farther inland.

Temperatures in the two counties vary greatly from season to season and commonly from day to day and from year to year. The average number of days in a year when the temperature reaches 90° or higher is 15, but the number ranges from 5 to 40. The number of days when the temperature is zero or lower is 10, on the average, but it ranges from more than 25 to less than 5. In 1 year out

[3] BY HANS E. ROSENDAL, State climatologist, Weather Bureau, Environmental Science Services Administration, U.S. Department of Commerce.

TABLE 10.—*Temperature and precipitation at Racine, Wis.*

Month	Temperature		Average degree days	Precipitation			Average snowfall or sleet
	Average daily maximum	Average daily minimum		Average total	One year in 10 will have—		
					Less than—	More than—	
	°F	°F	*Number*	*Inches*	*Inches*	*Inches*	*Inches*
January	31.8	16.6	1,270	1 99	0.6	3 4	9 9
February	34 1	18 3	1,090	1 51	.5	2 3	7 5
March	42 4	26 5	950	2 66	.8	4.4	8.9
April	55 1	36 6	570	2.82	.9	5.0	.7
May	66 6	45 6	300	3.79	1.7	5.8	.1
June	77 6	56 3	80	3 48	1 6	5 2	0
July	83 4	62.7	0	3 06	1 0	4.6	0
August	82 2	62 4	10	3.19	1.0	6.2	0
September	75 0	54 4	100	3 04	.9	7 1	0
October	63 0	43.8	370	2 03	.4	4.2	(1)
November	46.7	31.3	780	2 36	.7	4 5	2.5
December	34 9	20 8	1,150	1 97	1 0	3.6	7.6
Year	57 7	39.6	6,670	31 90	25.3	39.2	37.2

[1] Trace.

TABLE 11.—*Probabilities of last freezing temperatures in spring and first in fall*

[Data are for the eastern part of Kenosha and Racine Counties]

Probability	Dates for given probability and temperature				
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower
Spring:					
2 years in 10 later than	March 24	April 4	April 13	April 24	May 8
4 years in 10 later than	March 16	March 28	April 5	April 17	May 1
6 years in 10 later than	March 10	March 21	March 30	April 11	April 25
8 years in 10 later than	March 3	March 13	March 23	April 4	April 18
Fall:					
2 years in 10 earlier than	November 11	November 6	October 28	October 22	October 8
4 years in 10 earlier than	November 19	November 14	November 5	October 30	October 15
6 years in 10 earlier than	November 25	November 20	November 11	November 5	October 21
8 years in 10 earlier than	December 3	November 28	November 19	November 13	October 28

of 5, the temperature is 100° or higher on 1 or more days, and in 1 year out of 10, it is 20° below zero or lower on 1 or more days.

Table 11 shows the probability of freezing temperatures on or after given dates in spring and on or before given dates in fall. These data are for the eastern part of Kenosha and Racine Counties. In the extreme western part of the two counties, the dates for given probabilities and temperatures are about 8 days later in spring and 8 days earlier in fall than those listed in the table. The average growing season, or frost-free period, is 173 days in the western part of the counties and is about 190 days along Lake Michigan.

Table 12 gives the average number of growing-degree-days above three base temperatures for the months of April through October. During this 7-month period, the total number of growing-degree-days is 4,660 above a base of 40 degrees, 3,680 above a base of 45 degrees, and 2,750 above a base of 50 degrees. The figures in table 12 are fairly representative of Kenosha and Racine Counties.

During the growing season, the average number of growing-degree-day units above a base temperature of 40° is 4,340. Above a base temperature of 45°, it is 3,450, and above a base temperature of 50°, it is 2,660.

Growing-degree-days are based on the concept that plant growth and insect development begin at the time certain critical temperatures are reached, and that the amount of plant growth or insect development is roughly proportional to the number of accumulated degree days. The number of growing-degree-days is computed by subtracting the daily average temperature from a chosen base. The most common temperature bases used are 40 to 50 degrees. An average temperature of 60 degrees, for example, is 20 growing degrees above a base of 40 degrees, 15 degrees above a base of 45 degrees, and 10 degrees above a base of 50 degrees. On days when the average temperature is the same or lower than the base temperature, the number of growing-degree-days is zero.

TABLE 12.—*Growing-degree-days for specified months*

Month	Base 40°	Base 45°	Base 50°
April	230	140	50
May	490	350	240
June	790	640	490
July	1,000	840	690
August	990	830	680
September	720	570	420
October	440	310	180
Total	4,660	3,680	2,750

Annual precipitation normally is adequate for the crops grown. Although the supply of moisture is low in July and August, a severe drought that damages all crops is rare. About 55 percent of the annual rainfall comes in the months of May through September, when the main crops are grown. About 1 inch of rain is needed each week in summer for a good growth of crops. The probability of receiving this amount of rain during a 7-day period is greatest early in June and early in August. At these times a weekly rainfall of 1 inch or more can be expected 4 years in 10.

The driest part of the growing season is the last half of July and late in August. During the last part of August, the probability is that during a 7-day period only a trace of moisture will be received 2 years out of 10. The number of days in a year when 0.01 inch or more of precipitation falls averages 118, but it ranges from 108 to 128 days in 2 years out of 3.

The occurrence of dry days, or days having less than 0.01 inch of rain, is important. For example, in making field-cured hay of top quality, 3 or more consecutive dry days are needed. The probability of having 3 such days in a row is about 50 percent in June and is 55 percent in July and August.

A knowledge of annual precipitation and daily amounts of 0.5 inch or more is useful in estimating the hazard of erosion. Rainfall less intensive than 0.5 inch a day is not likely to cause gullying. Table 13 gives a summary of the amount of precipitation, lasting for a specified length of time from 30 minutes to 10 days, that can be expected in the return periods indicated. The data are for a 24-hour observation period and not for 24 consecutive hours. The amounts therefore are a little low. No distinction is made between rainfall and snowfall. In these counties the average number of days that have 0.5 inch or more of precipitation is 20. About 60 percent of the annual precipitation falls on days that receive 0.5 inch or more.

TABLE 13.—*Amount of precipitation of stated duration to be expected once in the specified number of years*

Duration	Return period of—						
	1 year	2 years	5 years	10 years	25 years	50 years	100 years
30 minutes	0.9	1.1	1.3	1.5	1.7	1.9	2.2
1 hour	1.2	1.4	1.7	1.9	2.2	2.4	2.7
2 hours	1.4	1.6	2.0	2.3	2.6	2.8	3.2
3 hours	1.5	1.7	2.2	2.5	2.8	3.2	3.5
6 hours	1.8	2.0	2.5	2.9	3.4	3.8	4.1
12 hours	2.0	2.4	3.0	3.4	3.9	4.4	4.9
24 hours	2.3	2.7	3.4	4.0	4.5	5.0	5.5
2 days	------	3.0	4.0	4.5	5.2	6.0	6.4
4 days	------	3.6	4.7	5.2	6.3	6.9	7.8
7 days	------	4.0	5.2	6.0	7.0	7.9	8.8
10 days	------	4.5	5.9	6.7	8.0	9.0	9.8

The average annual fall of snow and sleet is about 37 inches, but the amount of snow that falls in a year ranges from less than 15 inches to more than 80 inches. The average date of the first snowfall of 1 inch or more is December 5. The chance that 1 inch or more of snow will fall by November 9 is 1 year in 10, and the chance that this amount will fall by December 31 is 9 years in 10. The probability of snow on the ground increases until the middle of February and then decreases rapidly.

Freezing of the ground usually begins late in November or early in December and lasts until early in April. If snowfall of 10 inches or more occurs before the ground has frozen deeply, and if such cover remains throughout the winter, frost penetrates to a depth of only a few inches regardless of how low the temperature drops. In years when the ground freezes before the snow comes, however, and if temperatures are low and the snow cover is light and does not remain on the ground, the soil is likely to freeze to a depth of 36 inches or more.

Early Settlement and Development

The first explorers in the area that is now Kenosha and Racine Counties were Father Jacques Marquette and Louis Joliet. These men visited the area in 1673, on their return from exploring the Mississippi River by way of the Illinois River and Lake Michigan. At that time the region was inhabited by the Potawatomi Indians.

The first settlement, by Captain Gilbert Knapp in 1834, was at the mouth of the Root River, the present site of the city of Racine. In 1835, John Bullin and party settled at Pike Creek. In 1850, the name was changed to Kenosha, that of the present city, and the area was divided into two counties, each named for the principal settlement.

At the time of the first census in 1850, the population of the two counties was 25,707. By 1900, it had reached 67,351. In 1960, the population was 242,396.

Industries

Most of the industries in the two counties are in the eastern part, mainly in the cities of Racine and Kenosha. About half of the laboring force has jobs in manufacturing. Among the important industries are those that manufacture books, automobiles, farm equipment, and wax products. Also, there are plants that make sanitary fittings, wire, brass goods, iron and steel castings, pumps, and electrical equipment. In the western part of the survey area, sand and gravel are obtained from a number of pits.

In addition to highways, railroads, and air transportation, the counties are provided with harbor facilities. Kenosha, the principal harbor, is accessible to oceangoing vessels via the St. Lawrence Seaway, and there is a harbor at Racine.

Farming

This subsection tells about land use, type and size of farms, crops, pasture, and farm tenure in the two counties. The statistics are mainly from the U.S. Bureau of the Census, the 1965 Wisconsin Agricultural Statistics, and the 1959 Conservation Needs Study of Kenosha and Racine Counties.

In 1959, the total acreage in nonurban use was 349,369 acres, or about 89 percent of the two counties. Of this total, 266,060 acres was cropland, 33,393 acres was pasture, 24,215 acres was woodland, and 25,701 acres was marsh and wildlife land. Urban land occupied 44,056 acres in the counties.

By 1975, if present trends continue, the acreage of cropland will decrease by 20 percent; of permanent pasture, 52 percent; and of woodland, 21 percent. In contrast, the acreage of marsh and wildlife land will increase by 8 percent. The existing trend indicates that, by 1975, nonurban uses will increase by 155 percent.

The number of farms in the two counties in 1959 was 2,271. Of these, 630 were miscellaneous or unclassified farms. According to their main source of income, the rest were classified as follows:

	Number
Dairy farms	782
Field-crop farms, other than vegetable or fruit	431
Cash-grain farms	355
Livestock farms, other than poultry or dairy	200
Vegetable farms	81
General farms	80
Poultry farms	51
Fruit farms	5

Farms in the counties have increased in size but have decreased in number. In 1959, the size of the average farm was 121 acres, an increase of 24 acres since 1950. In 1935, there was a total of 3,781 farms, the largest number on record in the two counties. According to a study made in 1959 by the Wisconsin Department of Resource Development, 39 percent of the farm income was derived from the sale of dairy products, 35 percent from the sale of crops, and 26 percent from the sale of livestock, poultry, eggs, fruit, and other farm products.

Because the cost of labor is rising, the trend since 1959 has been toward more income from low-labor farm products and less income from high-labor farm products.

Corn, the leading crop in the survey area, was grown on more than 65,000 acres in 1964. In fields used for corn, the soils are plowed in fall or early in spring and are prepared for planting in May. To control weeds, the

corn is sprayed or cultivated late in spring or early in summer. Most of the crop is harvested as grain in October and November, but more than one-third of it is harvested for silage in September.

Alfalfa is the leading forage crop in the two counties. In 1964, it was grown on 39,800 acres, and in this year a mixture of clover and timothy was grown on 2,800 acres. Alfalfa normally produces more forage of high quality than clover or timothy, and it is more effective in controlling erosion. Forage crops generally are sown in spring with a nurse crop of small grain. The first cutting is taken the following year. Most of the crop is harvested for hay, but some is harvested for silage.

Oats were grown on about 25,100 acres in 1964, mainly as a nurse crop for hay crops. Usually, the soil is plowed or disked early in spring and then is planted by the first part of May. When the oats are mature in July or August, they are harvested by combine and the straw is baled and used as bedding.

In 1964, wheat was grown on 13,200 acres and barley on 5,250 acres. These small grains ordinarily are not used as nurse crops. The soil is plowed and the seedbed is prepared either in fall or in spring. After harvesting in July or August, the grain generally is sold as a cash crop.

Soybeans were grown on about 14,800 acres in 1964. In fields used for this crop, the soil is plowed in fall or spring, the seedbed is prepared in May, the soil is cultivated in summer, and the soybeans are harvested in fall.

Sod growing has become important in the survey area in recent years. Most of the sod farms are near Wind Lake, Racine County. If bluegrass is fertilized properly, it can be planted early in spring and harvested as sod by mid-September of the following year. Where growing conditions are less favorable, however, 2 years may be needed for producing good-quality turf.

Specialty crops are grown on less than 10,000 acres in these counties. Potatoes, canning peas, cabbage, and sweetcorn are the chief specialty crops. Also grown are onions, carrots, sugar beets, snap beans, mint, lettuce, rye, and buckwheat. Most of the acreage used for these crops is near the cities of Kenosha and Racine.

A total of 33,393 acres was in pasture in 1959. This acreage consisted of cropland used temporarily for pasture and of other open areas not suitable for plowing. Most of the woodland on operating farms is not protected from grazing.

About 60 percent of the farms in the survey area was operated by owners in 1959. Part-owners operated 22 percent, tenants 17 percent, and managers 1 percent. Some farmers who operate their own farms also rent additional land.

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Glossary

Acidity. See Reaction.

Alluvium. Soil or rock material, such as gravel, sand, silt, or clay, deposited by a stream.

Available moisture capacity. The difference between the amount of water in a soil at field capacity and the amount in the same soil at the permanent wilting point. Commonly expressed as inches of water per inch depth of soil.

Bottom land. Nearly level land on the bottom of a valley that has a stream flowing through it. Subject to flooding and often referred to as a flood plain.

Calcareous. A soil that contains enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; will not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder to individual grains under very slight pressure.

Contour stripcropping. Growing crops in strips that follow the contour or that are parallel to terraces or diversions; strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Diversion. A broad-bottomed ditch that serves to divert runoff water so that it will flow around the slope to a safe outlet.

Dolomite. A calcium-magnesium carbonate mineral. Limestone that contains magnesium carbonate is commonly called dolomitic limestone.

Drainage, natural. Refers to the conditions that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural drainage are recognized.

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Excessively drained soils are commonly very porous and rapidly permeable and have low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and in Podzolic soils commonly have mottling below 6 to 16 inches in the lower A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Erosion. The wearing away of the land surface by wind, moving water, or ice, and by such processes as landslides and creep.

Glacial outwash. Cross-bedded gravel, sand, and silt deposited by meltwater as it flowed from glacial ice.

Glacial till. Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons.

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and it is therefore marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has (1) distinctive characteristics caused by accumulation of clay, sesquioxides, humus, or some combination of these; (2) prismatic or blocky structure; (3) redder or stronger colors than the A horizon or (4) some combination of these. The combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. This layer, commonly called the soil parent material, is presumed to be like that from which the overlying horizons were formed in most soils. If the underlying material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath the A or B horizon.

Lacustrine. Material deposited in lake water and exposed by lowering of the water level or elevation of the land.

Loess. Geological deposits of fairly uniform, fine material, mostly silt, presumably deposited by wind.

Massive. Large uniform masses of cohesive soil, in some places with ill-defined and irregular breakage, as in some of the fine-textured alluvial soils; structureless.

Mottled. Irregularly marked with different colors that vary in number and size. Mottling in soils generally indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* or *many;* size—*fine, medium,* or *coarse;* contrast—*faint, distinct,* or *prominent.*

Muck. An organic soil consisting of fairly well decomposed organic material that is relatively high in mineral content, finely divided, and dark in color.

Peat. Unconsolidated soil material, largely undecomposed organic matter, that has accumulated where there has been excess moisture.

Permeability, soil. The quality of a soil that enables it to transmit air and water. The following relative classes of soil permeability refer to estimated rates of movement of water in inches per hour through saturated undisturbed cores under a one-half inch head of water:

	Inches per hour		*Inches per hour*
Very slow	Less than 0.05	Moderate	0.80 to 2.50
Slow	0.05 to 0.20	Moderately rapid	2.50 to 5.00
Moderately slow	0.20 to 0.80	Rapid	5.00 to 10.00
		Very rapid	10 or more

Profile, soil. A vertical section of a soil through all its horizons and extending into the parent material. See also Horizon, soil.

Reaction. The degree of acidity or alkalinity of soil expressed in pH values or in words as follows:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations and inequalities of the land surface, considered collectively.

Sand. Individual fragments or rocks and minerals that have diameters ranging from 0.05 millimeter (0.002 inch) to 2.0 millimeters (0.079 inch). Most sand grains consist of quartz, but they may be of any mineral composition. The term sand also is applied to a soil that contains 85 percent or more of sand not more than 10 percent clay.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants, and that has properties resulting from the integrated effect of climate and living matter acting upon parent material as conditioned by relief over periods of time.

Solum, soil. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizon.

Stratified. Deposited in layers. In soils, it refers to sandy and gravelly material, or both, when laid down by running water on stream terraces.

Structure, soil. The arrangement of primary soil particles into lumps, granules, or other aggregates. Structure is described by grade (weak, moderate, or strong), that is, the distinctness and durability of the aggregates; by the size of the aggregates (very fine, fine, medium, coarse, or very coarse); and their shape (platy, prismatic, columnar, blocky, granular, or crumb). A soil is described as structureless if there are no observable aggregates. Structureless soils may be massive (coherent) or single grain (noncoherent).

Blocky angular.—Aggregates are block shaped; they may have flat or rounded surfaces that join at sharp angles.

Blocky, subangular.—Aggregates have some rounded and some plane surfaces; vertices are rounded.

Columnar.—Aggregates are prismatic and are rounded at the upper ends.

Crumb.—Generally soft, small, porous aggregates, irregular, but tending toward a spherical shape.

Granular.—Roughly spherical, firm, small aggregates that may be either hard or soft but that are generally firmer than crumb and lack the distinct faces of blocky structure.

Platy.—Soil particles are arranged around a plane that is generally horizontal.

Prismatic.—Soil particles are arranged around a vertical line; aggregates have flat, vertical faces.

Subsoil. The B horizon of soils with distinct profiles. Generally, that part of the profile that is between the plow layer and the unweathered layers below.

Substratum. Any layer beneath the solum, either conforming (C or R) or unconforming.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil.

Terrace, stream. An area that is fairly level and formerly was the flood plain of a stream but now lies above the present flood plain; the area is underlain by stratified stream sediments.

Terracing. Construction of shallow, nearly level ditches that have broad slopes suitable for farming; used for controlling runoff water on sloping land.

Texture. The relative proportion of sand, silt, and clay particles in a soil. The basic textural classes in increasing proportions of fine particles are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth. The condition of a soil or seedbed in relation to the growth of plants, especially soil structure.

Upland. Land that lies above the stream terraces and this is underlain by bedrock at fairly shallow depths; generally, all areas that are not on terraces or bottom land.

Variant, soil. A soil having properties sufficiently different from other known soils to justify a new series name but occupying a geographic area so limited that creation of a new series is not believed to be justified.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Weathering. The physical and chemical disintegration and decomposition of rocks and minerals. Soil is the result of weathering and other chemical, physical, and biological alterations that have changed the upper part of the earth's crust through various periods of time.

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit		Recreation group		Wildlife group		Urban trees group
			Symbol	Page	Number	Page	Number	Page	Number
So	Sebewa silt loam, clayey substratum	97	IIw-5	8	6	16	5	18	6
SrB	Sisson fine sandy loam, 1 to 6 percent slopes	98	IIe-1	7	2	14	1	17	3
SsB	Sisson fine sandy loam, clayey substratum, 1 to 6 percent slopes	98	IIe-1	7	2	14	1	17	3
SzA	Symerton loam, 0 to 2 percent slopes	98	IIs-7	9	2	14	11	20	1
SzB	Symerton loam, 2 to 6 percent slopes	98	IIe-6	7	2	14	11	20	1
ThB	Theresa silt loam, 2 to 6 percent slopes	99	IIe-1	7	1	14	1	17	1
VaB	Varna silt loam, 2 to 6 percent slopes	100	IIe-6	7	3	15	11	20	2
VaB2	Varna silt loam, 2 to 6 percent slopes, eroded	100	IIe-6	7	3	15	11	20	2
VaC2	Varna silt loam, 6 to 12 percent slopes, eroded	100	IIIe-6	9	3	15	11	20	2
Wa	Wallkill silt loam	101	IIw-13	8	7	16	8	19	8
WeA	Warsaw loam, 0 to 2 percent slopes	101	IIs-1	8	2	14	3	18	1
WeB	Warsaw loam, 2 to 6 percent slopes	101	IIe-2	7	2	14	3	18	1
WgA	Warsaw loam, clayey substratum, 0 to 2 percent slopes	102	IIs-1	8	2	14	3	18	1
WgB	Warsaw loam, clayey substratum, 2 to to 6 percent slopes	102	IIe-2	7	2	14	3	18	1
WhA	Warsaw silt loam, 0 to 2 percent slopes	102	IIs-1	8	1	14	3	18	1
WhB	Warsaw silt loam, 2 to 6 percent slopes	102	IIe-2	7	1	14	3	18	1
WmA	Wasepi sandy loam, 1 to 3 percent slopes	102	IIIw-5	9	5	16	12	20	7
WnA	Wasepi sandy loam, clayey substratum, 1 to 3 percent slopes	103	IIIw-5	9	5	16	12	20	7
Ww	Wet alluvial land	103	Vw-14	10	7	16	8	19	8
WyA	Worthen silt loam, 0 to 3 percent slopes	103	I-1	7	5	16	8	19	8
YaA	Yahara fine sandy loam, 1 to 3 percent slopes	104	IIIw-5	9	5	16	2	18	6
ZuA	Zurich silt loam, 0 to 2 percent slopes	104	I-1	7	1	14	1	17	1
ZuB	Zurich silt loam, 2 to 6 percent slopes	105	IIe-1	7	1	14	1	17	1
ZuC2	Zurich silt loam, 6 to 12 percent slopes, eroded	105	IIIe-1	9	1	14	1	17	1

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GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit		Recreation group		Wildlife group		Urban trees group
			Symbol	Page	Number	Page	Number	Page	Number
MzdD	Morley silt loam, 12 to 20 percent slopes	86	IVe-6	10	3	15	1	17	2
MzdD2	Morley silt loam, 12 to 20 percent slopes, eroded	86	IVe-6	10	3	15	1	17	2
MzdE	Morley silt loam, 20 to 30 percent slopes	87	VIe-6	11	3	15	1	17	2
MzeC3	Morley soils, 6 to 12 percent slopes, severely eroded	87	IVe-6	10	3	15	1	17	2
MzeD3	Morley soils, 12 to 20 percent slopes, severely eroded	87	VIe-6	11	3	15	1	17	2
MzfA	Mundelein silt loam, 1 to 3 percent slopes	88	IIIw-3	9	5	16	12	20	6
Mzg	Muskego muck	88	Vw-14	10	8	17	9	19	9
Mzk	Mussey loam	89	IIIw-5	9	6	16	5	18	6
Na	Navan silt loam	89	IIw-1	7	6	16	5	18	6
Oc	Ogden muck	90	IIIw-9	10	8	17	9	19	9
Pa	Palms muck	90	IIIw-9	10	8	17	9	19	9
Ph	Pella silt loam	91	IIw-1	7	6	16	5	18	6
Pt	Plano silt loam, gravelly substratum	91	I-1	7	1	14	11	20	1
RaA	Radford silt loam, 0 to 3 percent slopes	92	IIw-2	8	7	16	8	19	6
RgB	Ringwood silt loam, 2 to 6 percent slopes	93	IIe-1	7	1	14	3	18	1
RgC	Ringwood silt loam, 6 to 12 percent slopes	93	IIIe-1	9	1	14	3	18	1
Rt	Rollin muck	93	IVw-7	10	8	17	9	19	9
Ry	Rough broken land	93	VIIIs-10	11	9	17	10	20	10
SeA	St. Charles silt loam, gravelly substratum, 0 to 2 percent slopes	94	I-1	7	1	14	1	17	1
SeB	St. Charles silt loam, gravelly substratum, 2 to 6 percent slopes	94	IIe-1	7	1	14	1	17	1
Sf	Sandy and gravelly land	94	VIIIs-10	11	9	17	10	20	10
Sfb	Sandy lake beaches	94	VIIIs-10	11	9	17	10	20	10
Sg	Sawmill silt loam, calcareous variant	95	Vw-14	10	6	16	8	19	8
ShA	Saylesville silt loam, 0 to 2 percent slopes	95	IIs-7	9	3	15	1	17	2
ShB	Saylesville silt loam, 2 to 6 percent slopes	95	IIe-6	7	3	15	1	17	2
ShC2	Saylesville silt loam, 6 to 12 percent slopes	96	IIIe-6	9	3	15	1	17	2
SkA	Saylesville silt loam, dark surface variant, 0 to 2 percent slopes	96	IIs-7	9	3	15	11	20	2
SkB	Saylesville silt loam, dark surface variant, 2 to 6 percent slopes	96	IIe-6	7	3	15	11	20	2
Sm	Sebewa silt loam	97	IIw-5	8	6	16	5	18	6

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit		Recreation group		Wildlife group		Urban trees group
			Symbol	Page	Number	Page	Number	Page	Number
Ht	Houghton muck	77	IIIw-9	10	8	17	9	19	9
KaA	Kane loam, 1 to 3 percent slopes	78	IIw-5	8	5	16	4	18	6
KhA	Kane silt loam, clayey substratum, 1 to 3 percent slopes	78	IIw-5	8	5	16	4	18	6
KmB	Knowles silt loam, 2 to 6 percent slopes	78	IIe-2	7	2	14	1	17	1
Lp	Lawson silt loam, calcareous variant	79	IIw-13	8	7	16	8	19	7
Lu	Loamy land	79	VIIIs-10	11	9	17	10	20	10
LyB	Lorenzo loam, 2 to 6 percent slopes	79	IIIe-4	9	2	14	3	18	1
MeB	Markham silt loam, 2 to 6 percent slopes	80	IIe-6	7	3	15	3	18	2
MeB2	Markham silt loam, 2 to 6 percent slopes, eroded	80	IIe-6	7	3	15	3	18	2
MeC2	Markham silt loam, 6 to 12 percent slopes, eroded	80	IIIe-6	9	3	15	3	18	2
Mf	Marsh	80	VIIIw-15	11	9	17	10	20	10
MgA	Martinton silt loam, 1 to 3 percent slopes	81	IIw-2	8	5	16	4	18	6
MkA	Matherton loam, 1 to 3 percent slopes	82	IIw-5	8	5	16	2	18	6
MlA	Matherton loam, clayey substratum, 1 to 3 percent slopes	82	IIw-5	8	5	16	2	18	6
MpB	McHenry silt loam, 2 to 6 percent slopes	82	IIe-1	7	1	14	1	17	1
MpC2	McHenry silt loam, 6 to 12 percent slopes, eroded	83	IIIe-1	9	1	14	1	17	1
MwB	Miami loam, 2 to 6 percent slopes	83	IIe-1	7	1	14	1	17	1
MwC2	Miami loam, 6 to 12 percent slopes, eroded	84	IIIe-1	9	1	14	1	17	1
MwD2	Miami loam, 12 to 20 percent slopes, eroded	84	IVe-1	10	1	14	1	17	1
MxB	Miami loam, sandy loam substratum, 2 to 6 percent slopes	84	IIe-1	7	2	14	1	17	1
MxC2	Miami loam, sandy loam substratum, 6 to 12 percent slopes, eroded	84	IIIe-1	9	2	14	1	17	1
MxD2	Miami loam, sandy loam substratum, 12 to 20 percent slopes, eroded	84	IVe-1	10	2	14	1	17	1
MyB	Miami silt loam, 2 to 6 percent slopes	84	IIe-1	7	1	14	1	17	1
MyC2	Miami silt loam, 6 to 12 percent slopes, eroded	84	IIIe-1	9	1	14	1	17	1
Mzc	Montgomery silty clay	85	IIw-1	7	7	16	5	18	6
MzdB	Morley silt loam, 2 to 6 percent slopes	86	IIe-6	7	3	15	1	17	2
MzdB2	Morley silt loam, 2 to 6 percent slopes, eroded	86	IIe-6	7	3	15	1	17	2
MzdC	Morley silt loam, 6 to 12 percent slopes	86	IIIe-6	9	3	15	1	17	2
MzdC2	Morley silt loam, 6 to 12 percent slopes, eroded	86	IIIe-6	9	3	15	1	17	2

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit		Recreation group		Wildlife group		Urban trees group
			Symbol	Page	Number	Page	Number	Page	Number
CyA	Conover silt loam, 1 to 3 percent slopes	68	IIw-2	8	5	16	2	18	6
DaA	Darroch fine sandy loam, neutral variant, 0 to 3 percent slopes	68	IIIw-3	9	5	16	12	20	7
Dh	Dorchester silt loam	69	IIw-13	8	7	16	1	17	1
DrA	Dresden loam, 1 to 3 percent slopes	69	IIe-2	7	2	14	1	17	1
Dt	Drummer silt loam, gravelly substratum	70	IIw-1	7	6	16	5	18	7
EtA	Elliott silty clay loam, 0 to 2 percent slopes	71	IIw-2	8	5	16	4	18	6
EtB	Elliott silty clay loam, 2 to 6 percent slopes	71	IIw-2	8	5	16	4	18	6
FaA	Fabius loam, 1 to 3 percent slopes	71	IIIw-5	9	5	16	12	20	6
FmB	Fox sandy loam, 1 to 6 percent slopes	73	IIIe-4	9	2	14	1	17	3
FmC2	Fox sandy loam, 6 to 12 percent slopes, eroded	73	IIIe-1	9	2	14	1	17	3
FoA	Fox loam, 0 to 2 percent slopes	72	IIs-1	8	2	14	1	17	1
FoB	Fox loam, 2 to 6 percent slopes	72	IIe-2	7	2	14	1	17	1
FoC2	Fox loam, 6 to 12 percent slopes, eroded	72	IIIe-1	9	2	14	1	17	1
FrA	Fox loam, clayey substratum, 0 to 2 percent slopes	72	IIs-1	8	2	14	1	17	1
FrB	Fox loam, clayey substratum, 2 to 6 percent slopes	73	IIe-2	7	2	14	1	17	1
FsA	Fox silt loam, 0 to 2 percent slopes	73	IIs-1	8	1	14	1	17	1
FsB	Fox silt loam, 2 to 6 percent slopes	73	IIe-2	7	1	14	1	17	1
Gf	Granby fine sandy loam	74	IIIw-5	9	6	16	5	18	7
Gm	Granby fine sandy loam, loamy substratum	74	IIIw-5	9	6	16	5	18	7
GnA	Granby fine sandy loam, brown subsoil variant, 0 to 3 percent slopes	74	IIIw-5	9	5	16	12	20	7
GsB	Griswold loam, 2 to 6 percent slopes	75	IIe-1	7	2	14	3	18	1
GsC2	Griswold loam, 6 to 12 percent slopes, eroded	75	IIIe-1	9	2	14	3	18	1
HbB	Hebron sandy loam, 2 to 6 percent slopes	76	IIe-6	7	2	14	1	17	3
HeA	Hebron loam, 0 to 2 percent slopes	75	IIs-7	9	2	14	1	17	1
HeB2	Hebron loam, 2 to 6 percent slopes, eroded	76	IIe-6	7	2	14	1	17	1
HeC2	Hebron loam, 6 to 12 percent slopes, eroded	76	IIIe-6	9	2	14	1	17	1
HmB	Hochheim loam, 2 to 6 percent slopes	76	IIe-1	7	1	14	1	17	5
HmC2	Hochheim loam, 6 to 12 percent slopes, eroded	76	IIIe-1	9	1	14	1	17	5
HmD2	Hochheim loam, 12 to 20 percent slopes, eroded	77	IVe-1	10	1	14	1	17	5

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and the soil series to which the mapping unit belongs. In referring to a capability unit, read the introduction to the section it is in for general information about its management. Other information is given in tables as follows:

Predicted yields, table 1, p. 12.
Engineering uses of the soils, tables 2, 3, 4, and 5, pp. 22 through 48.
Limitation of soils for nonfarm uses, table 6, p. 49.
Suitability of soils for urban trees, table 7, p. 57.
Acreage and extent, table 8, p. 59.

Map symbol	Mapping unit	Page	Capability unit		Recreation group		Wildlife group		Urban trees group
			Symbol	Page	Number	Page	Number	Page	Number
Ac	Adrian muck	58	IVw-7	10	8	17	9	19	9
Am	Alluvial land	58	IIIw-5	9	7	16	1	17	1
AtA	Ashkum silty clay loam, 0 to 3 percent slopes	61	IIw-1	7	6	16	5	18	6
AuA	Aztalan sandy loam, 1 to 3 percent slopes	62	IIIw-5	9	5	16	4	18	6
AzA	Aztalan loam, 0 to 2 percent slopes	62	IIw-2	8	5	16	4	18	6
AzB	Aztalan loam, 2 to 6 percent slopes	62	IIw-2	8	5	16	4	18	6
BcA	Beecher silt loam, 1 to 3 percent slopes	63	IIw-2	8	5	16	2	18	6
BlA	Blount silt loam, 1 to 3 percent slopes	63	IIw-2	8	5	16	2	18	6
BmB	Boyer loamy sand, 1 to 6 percent slopes	64	IVs-3	10	4	16	7	19	4
BmC2	Boyer loamy sand, 6 to 12 percent slopes, eroded	64	IVe-4	10	4	16	7	19	4
BnB	Boyer sandy loam, 2 to 6 percent slopes	64	IIIe-4	9	2	14	7	19	3
CcB	Casco sandy loam, 2 to 6 percent slopes	65	IIIe-4	9	2	14	6	19	5
CcC2	Casco sandy loam, 6 to 12 percent slopes, eroded	65	IVe-4	10	2	14	6	19	5
CeB	Casco loam, 2 to 6 percent slopes	65	IIIe-4	9	2	14	6	19	5
CeB2	Casco loam, 2 to 6 percent slopes, eroded	65	IIIe-4	9	2	14	6	19	5
CeC2	Casco loam, 6 to 12 percent slopes, eroded	65	IVe-4	10	2	14	6	19	5
CeD2	Casco loam, 12 to 20 percent slopes, eroded	65	VIe-4	11	2	14	6	19	5
CoC	Casco-Miami loams, 6 to 12 percent slopes	65	IVe-4	10	2	14	6	19	5
CoD	Casco-Miami loams, 12 to 20 percent slopes	66	VIe-4	11	2	14	6	19	5
CrC	Casco-Rodman complex, 6 to 12 percent slopes	66	IVe-4	10	2	14	6	19	5
CrD2	Casco-Rodman complex, 12 to 20 percent slopes, eroded	66	VIe-4	11	2	14	6	19	5
CrE	Casco-Rodman complex, 20 to 35 percent slopes	66	VIIs-5	11	2	14	6	19	5
Cv	Clayey land	66	VIIIs-10	11	9	17	10	20	10
Cw	Colwood silt loam	67	IIIw-3	9	6	16	5	18	6

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

UNIVERSITY OF WISCONSIN, WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY, SOILS DEPARTMENT, AND WISCONSIN AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

KENOSHA AND RACINE COUNTIES, WISCONSIN

N

Scale 1:190,080

1 0 1 2 3 4 Miles

NOTE—

This map is intended for general planning. Each delineation may contain soils having ratings different from those shown on the map. Use detailed soil maps for operational planning.

SOIL ASSOCIATIONS

1 Varna-Elliott-Ashkum association: Well-drained to poorly drained soils that have a silty clay loam to clay subsoil; formed in thin loess and the underlying clay loam or silty clay loam glacial till on ridges and knobs

2 Morley-Beecher-Ashkum association: Well-drained to poorly drained soils that have a silty clay or silty clay loam subsoil; formed in thin loess and the underlying clay loam or silty clay loam glacial till on ridges and knobs

3 Hebron-Montgomery-Aztalan association: Well-drained to poorly drained soils that have a loam to silty clay subsoil; underlain by clayey to loamy lacustrine and outwash material on hills, knobs, and lake plains

4 Fox-Casco association: Well-drained soils that have a clay loam and silty clay loam subsoil; moderately deep to shallow over sand and gravel, on stream terraces

5 Houghton-Palms association: Very poorly drained organic soils; in basins and depressions

6 Miami association: Well-drained soils that have a silty clay loam and clay loam subsoil; formed in thin loess and the underlying loamy glacial till on ridges and knobs

7 Casco-Rodman association: Well-drained and excessively drained soils that have a clay loam or gravelly loam subsoil; shallow over sand and gravel, on stream terraces and morainic ridges

8 Boyer-Granby association: Well-drained to very poorly drained soils that have a loam to sand subsoil; underlain by sandy glacial outwash on ridges and knobs and in drainageways and depressions

9 Warsaw-Plano association: Well-drained soils that have a loam to silty clay loam subsoil; moderately deep to deep over sand and gravel, on stream terraces

October 1969

INDEX TO MAP SHEETS
KENOSHA AND RACINE COUNTIES, WISCONSIN

Scale 1:190,080

1 0 1 2 3 4 Miles

N

WAUKESHA COUNTY | MILWAUKEE COUNTY

R. 19 E. | R. 20 E. | R. 21 E. | R. 22 E. | R. 23 E.

42°50′

T. 4 N.

T. 3 N.

T. 2 N.

T. 1 N.

42°40′

42°30′

88°10′ | 88°00′ | 87°50′

WALWORTH COUNTY

RACINE COUNTY

KENOSHA COUNTY

McHENRY COUNTY

LAKE COUNTY

ILLINOIS

NORWAY

WATERFORD

RAYMOND

CALEDONIA

MT PLEASANT

ROCHESTER

DOVER

YORKVILLE

BURLINGTON

PARIS

BRIGHTON

SOMERS

WHEATLAND

BRISTOL

SALEM

RANDALL

PLEASANT PRAIRIE

Caldwell

Tichigan

Long Lake

Wind Lake

Tichigan Lake

Waubeesee Lake

Union Church

Raymond

Husher

Tabor

Wind Point

Inset, sheet 9

North Cape

Thompsonville

Waterford

Frankville

North Bay

Beaumont

Rochester

RACINE

Ives Grove

Sturtevant

Long Lake

Eagle

Eagle Lake

Echo Lake

Browns Lake

Burlington

Kansasville

Union Grove

Somers

Bohner Lake

Paris

Brighton

Inset, sheet 63

KENOSHA

Slades Corners

Klondike

Paddock Lake

New Munster

Silver Lake

Salem

Hooker Lake

Bristol

Pleasant Prairie

Inset, sheet 80

Powers Lake

Bassett

Twin Lakes

Center Lake

South Kenosha

Benedict Lake

Marie Lake

Wilmot

Camp Lake

Trevor

Lake Shangrila

Carol Beach

Inset, sheet 97

Benet Lake

SOIL LEGEND

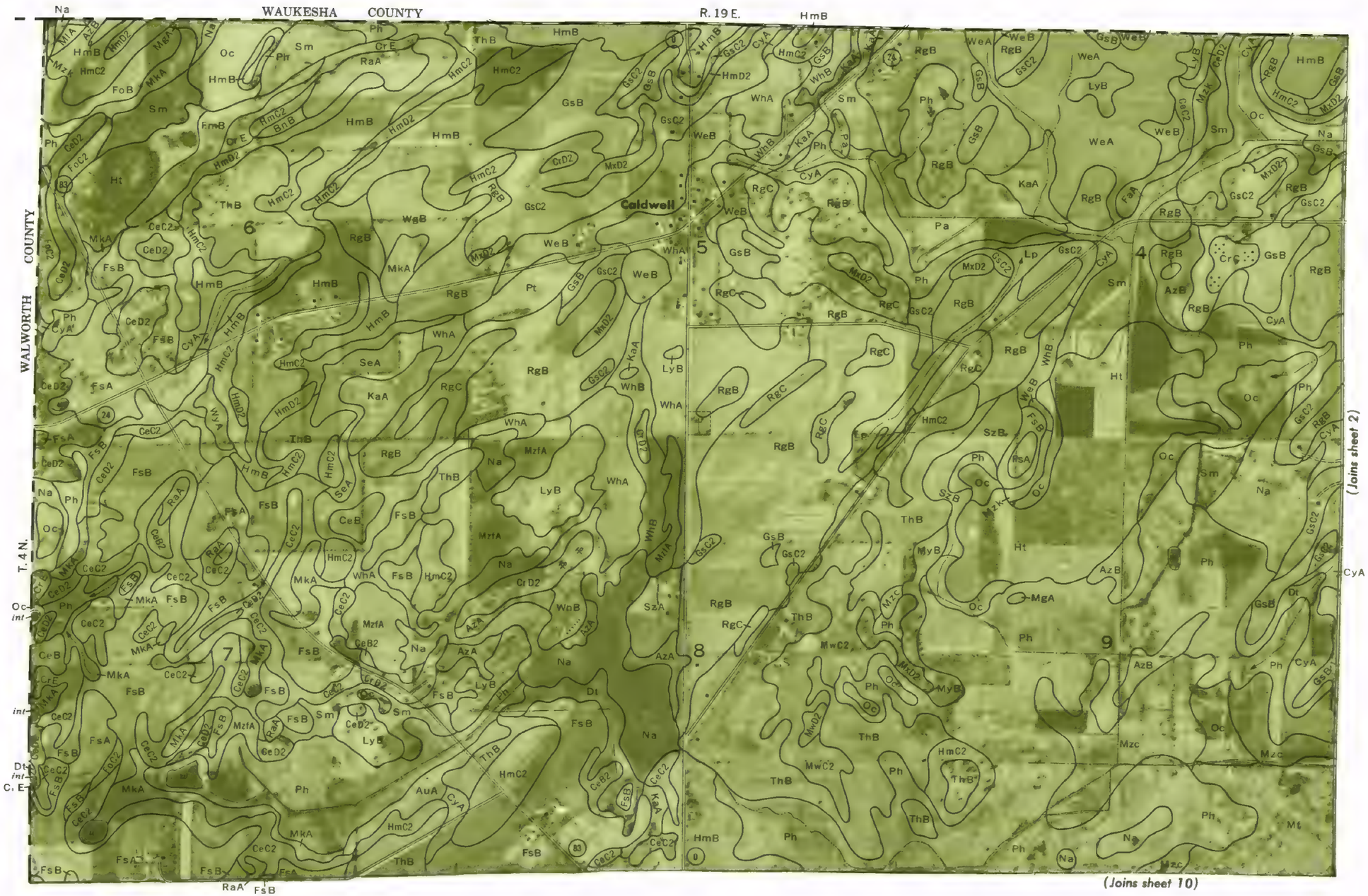
The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, or E, shows the slope. Most symbols without a slope letter are those of nearly level soils or land types, but some are for soils or land types that have a considerable range in slope. The final number, 2 or 3, in a symbol indicates that the soil is eroded or severely eroded.

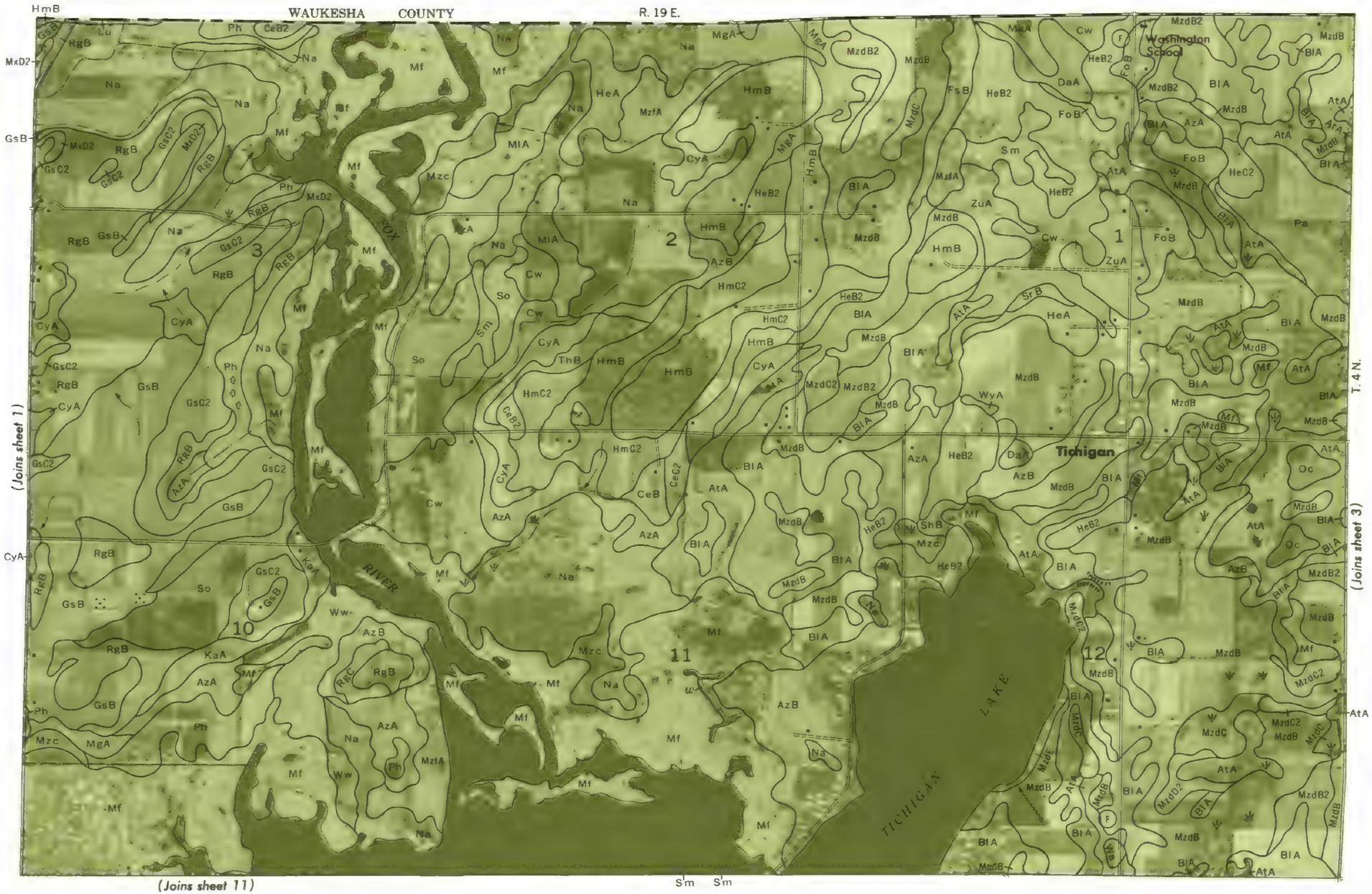
SYMBOL	NAME
Ac	Adrian muck
Am	Alluvial land
AtA	Ashkum silty clay loam, 0 to 3 percent slopes
AuA	Aztalan sandy loam, 1 to 3 percent slopes
AzA	Aztalan loam, 0 to 2 percent slopes
AzB	Aztalan loam, 2 to 6 percent slopes
BcA	Beecher silt loam, 1 to 3 percent slopes
BlA	Blount silt loam, 1 to 3 percent slopes
BmB	Boyer loamy sand, 1 to 6 percent slopes
BmC2	Boyer loamy sand, 6 to 12 percent slopes, eroded
BnB	Boyer sandy loam, 2 to 6 percent slopes
CcB	Casco sandy loam, 2 to 6 percent slopes
CcC2	Casco sandy loam, 6 to 12 percent slopes, eroded
CeB	Casco loam, 2 to 6 percent slopes
CeB2	Casco loam, 2 to 6 percent slopes, eroded
CeC2	Casco loam, 6 to 12 percent slopes, eroded
CeD2	Casco loam, 12 to 20 percent slopes, eroded
CoC	Casco-Miami loams, 6 to 12 percent slopes
CoD	Casco-Miami loams, 12 to 20 percent slopes
CrC	Casco Rodman complex, 6 to 12 percent slopes
CrD2	Casco-Rodman complex, 12 to 20 percent slopes, eroded
CrE	Casco-Rodman complex, 20 to 35 percent slopes
Cv	Clayey land
Cw	Colwood silt loam
CyA	Conover silt loam, 1 to 3 percent slopes
DaA	Darroch fine sandy loam, neutral variant, 0 to 3 percent slopes
Dh	Dorchester silt loam
DrA	Dresden loam, 1 to 3 percent slopes
Dt	Drummer silt loam, gravelly substratum
EtA	Elliott silty clay loam, 0 to 2 percent slopes
EtB	Elliott silty clay loam, 2 to 6 percent slopes
FaA	Fabius loam, 1 to 3 percent slopes
FmB	Fox sandy loam, 1 to 6 percent slopes
FmC2	Fox sandy loam, 6 to 12 percent slopes, eroded
FoA	Fox loam, 0 to 2 percent slopes
FoB	Fox loam, 2 to 6 percent slopes
FoC2	Fox loam, 6 to 12 percent slopes, eroded
FrA	Fox loam, clayey substratum, 0 to 2 percent slopes
FrB	Fox loam, clayey substratum, 2 to 6 percent slopes
FsA	Fox silt loam, 0 to 2 percent slopes
FsB	Fox silt loam, 2 to 6 percent slopes
Gf	Granby fine sandy loam
Gm	Granby fine sandy loam, loamy substratum
GnA	Granby fine sandy loam, brown subsoil variant, 0 to 3 percent slopes
GsB	Griswold loam, 2 to 6 percent slopes
GsC2	Griswold loam, 6 to 12 percent slopes, eroded
HbB	Hebron sandy loam, 2 to 6 percent slopes
HeA	Hebron loam, 0 to 2 percent slopes
HeB2	Hebron loam, 2 to 6 percent slopes, eroded
HeC2	Hebron loam, 6 to 12 percent slopes, eroded
HmB	Hochheim loam, 2 to 6 percent slopes
HmC2	Hochheim loam, 6 to 12 percent slopes, eroded
HmD2	Hochheim loam, 12 to 20 percent slopes, eroded
Ht	Houghton muck
KaA	Kane loam, 1 to 3 percent slopes
KhA	Kane silt loam, clayey substratum, 1 to 3 percent slopes
KmB	Knowles silt loam, 2 to 6 percent slopes
Lp	Lawson silt loam, calcareous variant
Lu	Loamy land
LyB	Lorenzo loam, 2 to 6 percent slopes
MeB	Markham silt loam, 2 to 6 percent slopes
MeB2	Markham silt loam, 2 to 6 percent slopes, eroded
MeC2	Markham silt loam, 6 to 12 percent slopes, eroded
Mf	Marsh
MgA	Martinton silt loam, 1 to 3 percent slopes
MkA	Matherton loam, 1 to 3 percent slopes
MlA	Matherton loam, clayey substratum, 1 to 3 percent slopes
MpB	McHenry silt loam, 2 to 6 percent slopes
MpC2	McHenry silt loam, 6 to 12 percent slopes, eroded
MwB	Miami loam, 2 to 6 percent slopes
MwC2	Miami loam, 6 to 12 percent slopes, eroded
MwD2	Miami loam, 12 to 20 percent slopes, eroded
MxB	Miami loam, sandy loam substratum, 2 to 6 percent slopes
MxC2	Miami loam, sandy loam substratum, 6 to 12 percent slopes, eroded
MxD2	Miami loam, sandy loam substratum, 12 to 20 percent slopes, eroded
MyB	Miami silt loam, 2 to 6 percent slopes
MyC2	Miami silt loam, 6 to 12 percent slopes, eroded
Mzc	Montgomery silty clay
MzdB	Morley silt loam, 2 to 6 percent slopes
MzdB2	Morley silt loam, 2 to 6 percent slopes, eroded
MzdC	Morley silt loam, 6 to 12 percent slopes
MzdC2	Morley silt loam, 6 to 12 percent slopes, eroded
MzdD	Morley silt loam, 12 to 20 percent slopes
MzdD2	Morley silt loam, 12 to 20 percent slopes, eroded
MzdE	Morley silt loam, 20 to 30 percent slopes
MzeC3	Morley soils, 6 to 12 percent slopes, severely eroded
MzeD3	Morley soils, 12 to 20 percent slopes, severely eroded
MzfA	Mundelein silt loam, 1 to 3 percent slopes
Mzg	Muskego muck
Mzk	Mussey loam
Na	Navan silt loam
Oc	Ogden muck
Pa	Palms muck
Ph	Pella silt loam
Pt	Plano silt loam, gravelly substratum
RaA	Radford silt loam, 0 to 3 percent slopes
RgB	Ringwood silt loam, 2 to 6 percent slopes
RgC	Ringwood silt loam, 6 to 12 percent slopes
Rt	Rolin muck
Ry	Rough broken land
SeA	St. Charles silt loam, gravelly substratum, 0 to 2 percent slopes
SeB	St. Charles silt loam, gravelly substratum, 2 to 6 percent slopes
Sf	Sandy and gravelly land
Sfb	Sandy lake beaches
Sg	Sawmill silt loam, calcareous variant
ShA	Saylesville silt loam, 0 to 2 percent slopes
ShB	Saylesville silt loam, 2 to 6 percent slopes
ShC2	Saylesville silt loam, 6 to 12 percent slopes, eroded
SkA	Saylesville silt loam, dark surface variant, 0 to 2 percent slopes
SkB	Saylesville silt loam, dark surface variant, 2 to 6 percent slopes
Sm	Sebewa silt loam
So	Sebewa silt loam, clayey substratum
SrB	Sisson fine sandy loam, 1 to 6 percent slopes
SsB	Sisson fine sandy loam, clayey substratum, 1 to 6 percent slopes
SzA	Symerton loam, 0 to 2 percent slopes
SzB	Symerton loam, 2 to 6 percent slopes
ThB	Theresa silt loam, 2 to 6 percent slopes
VaB	Varna silt loam, 2 to 6 percent slopes
VaB2	Varna silt loam, 2 to 6 percent slopes, eroded
VaC2	Varna silt loam, 6 to 12 percent slopes, eroded
Wa	Wallkill silt loam
WeA	Warsaw loam, 0 to 2 percent slopes
WeB	Warsaw loam, 2 to 6 percent slopes
WgA	Warsaw loam, clayey substratum, 0 to 2 percent slopes
WgB	Warsaw loam, clayey substratum, 2 to 6 percent slopes
WhA	Warsaw silt loam, 0 to 2 percent slopes
WhB	Warsaw silt loam, 2 to 6 percent slopes
WmA	Wasepi sandy loam, 1 to 3 percent slopes
WnA	Wasepi sandy loam, clayey substratum, 1 to 3 percent slopes
Ww	Wet alluvial land
WyA	Worthen silt loam, 0 to 3 percent slopes
YaA	Yahara fine sandy loam, 1 to 3 percent slopes
ZuA	Zurich silt loam, 0 to 2 percent slopes
ZuB	Zurich silt loam, 2 to 6 percent slopes
ZuC2	Zurich silt loam, 6 to 12 percent slopes, eroded

Soil map constructed 1969 by Cartographic Division, Soil Conservation Service, USDA, from 1963 aerial photographs. Controlled mosaic based on Wisconsin plane coordinate system, south zone, Lambert conformal conic projection, 1927 North American datum.

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department, and Wisconsin Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 1





KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 2

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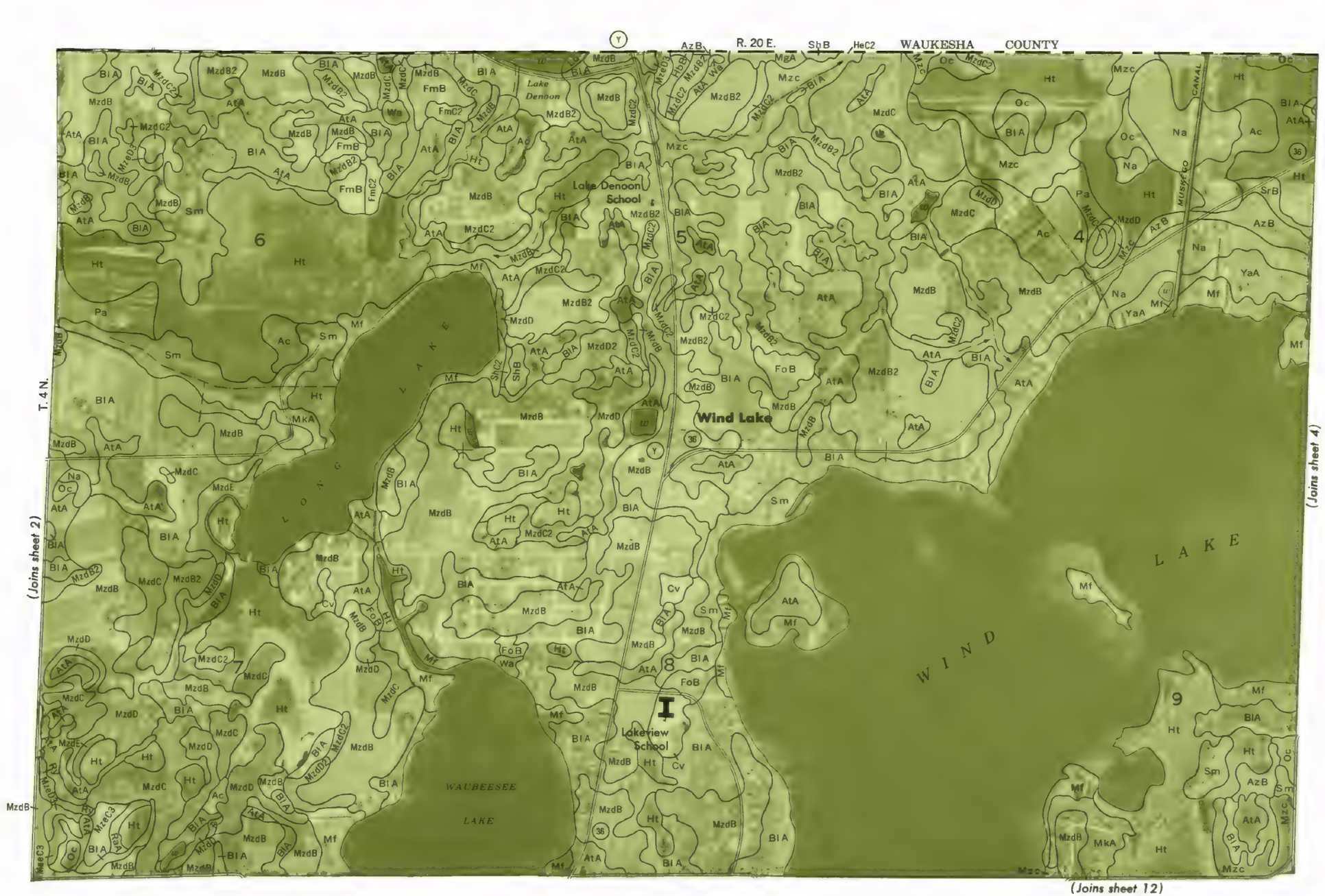
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 3



1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 4

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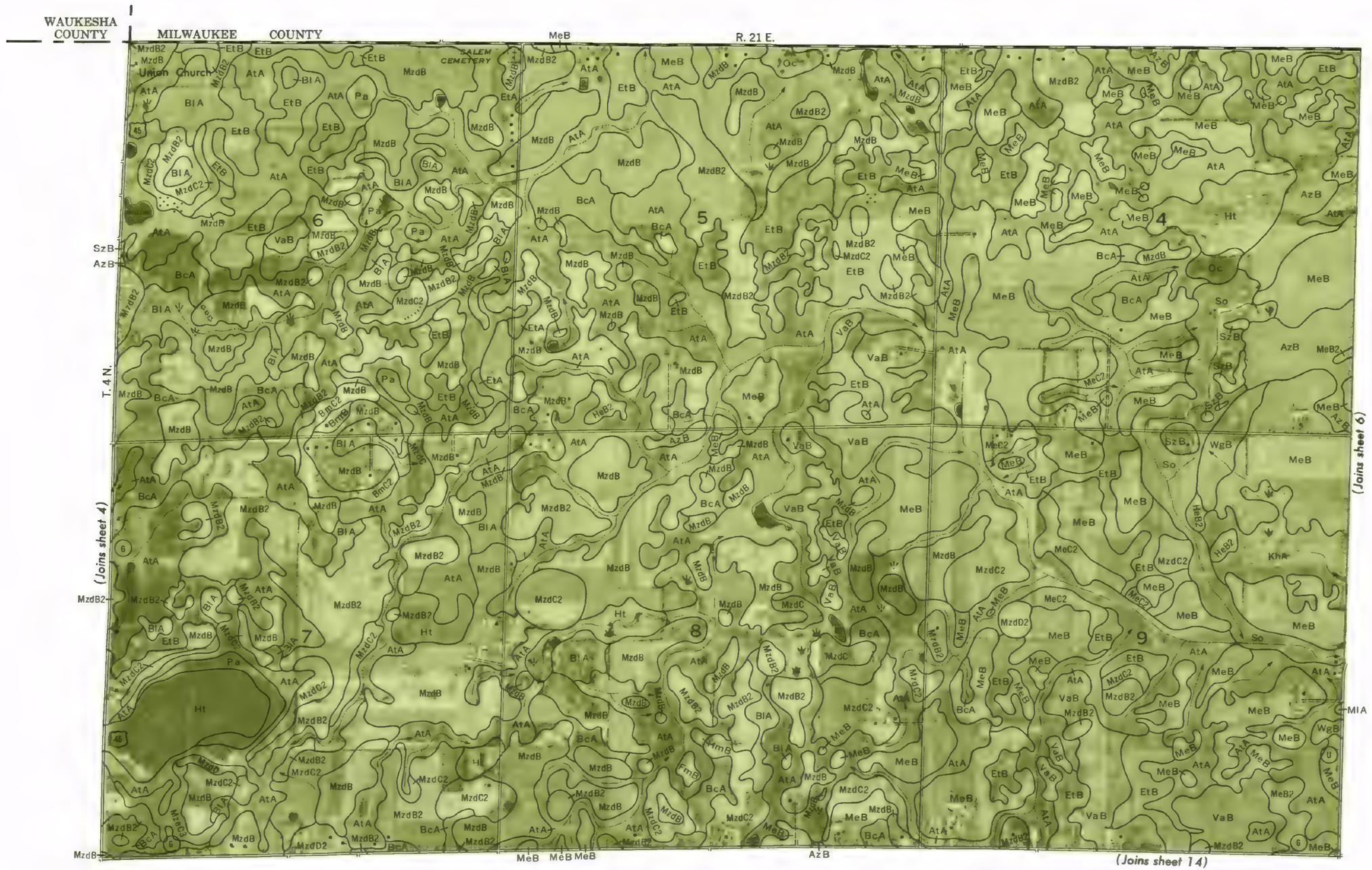
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 5



KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 6

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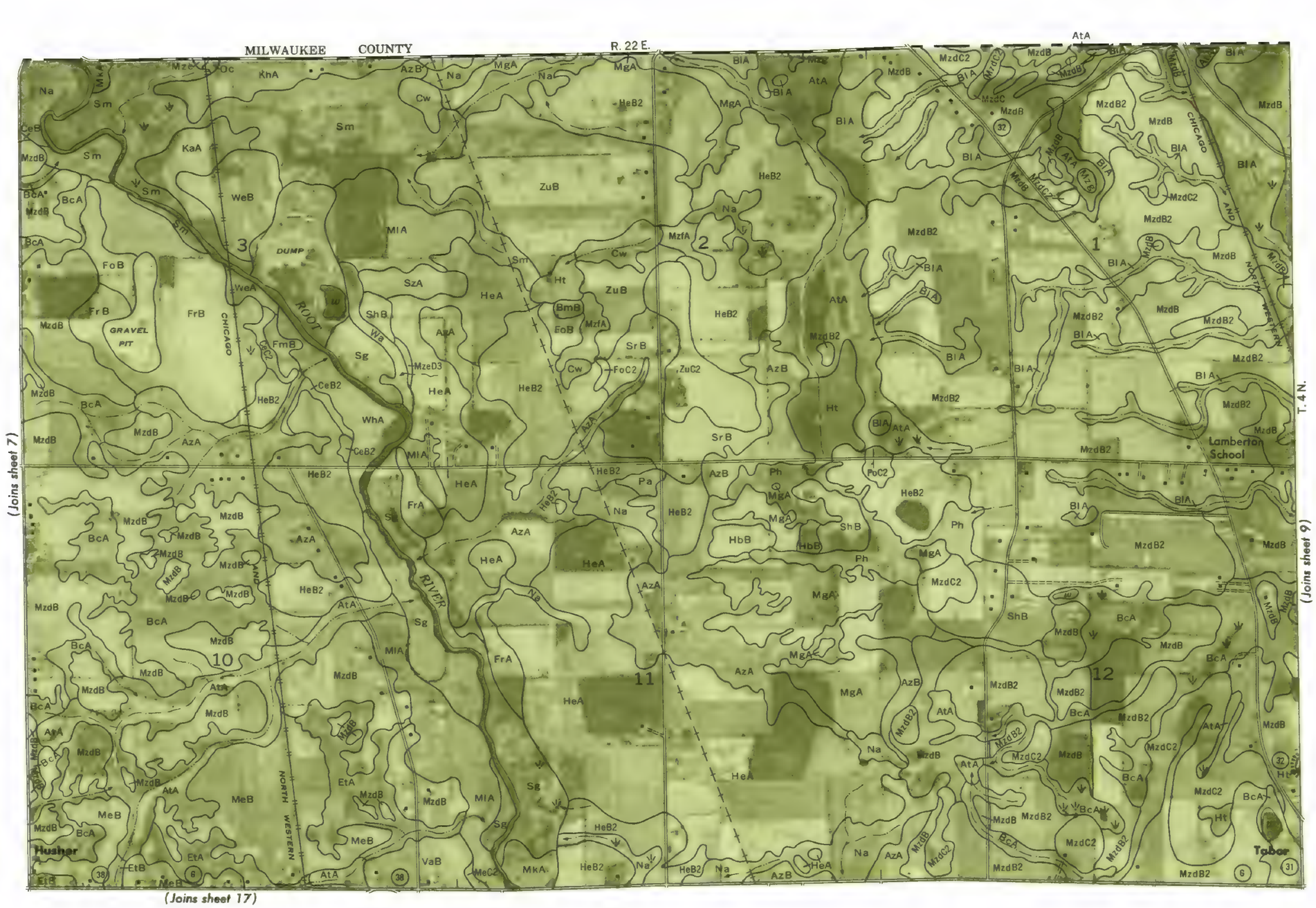
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 7



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Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 8

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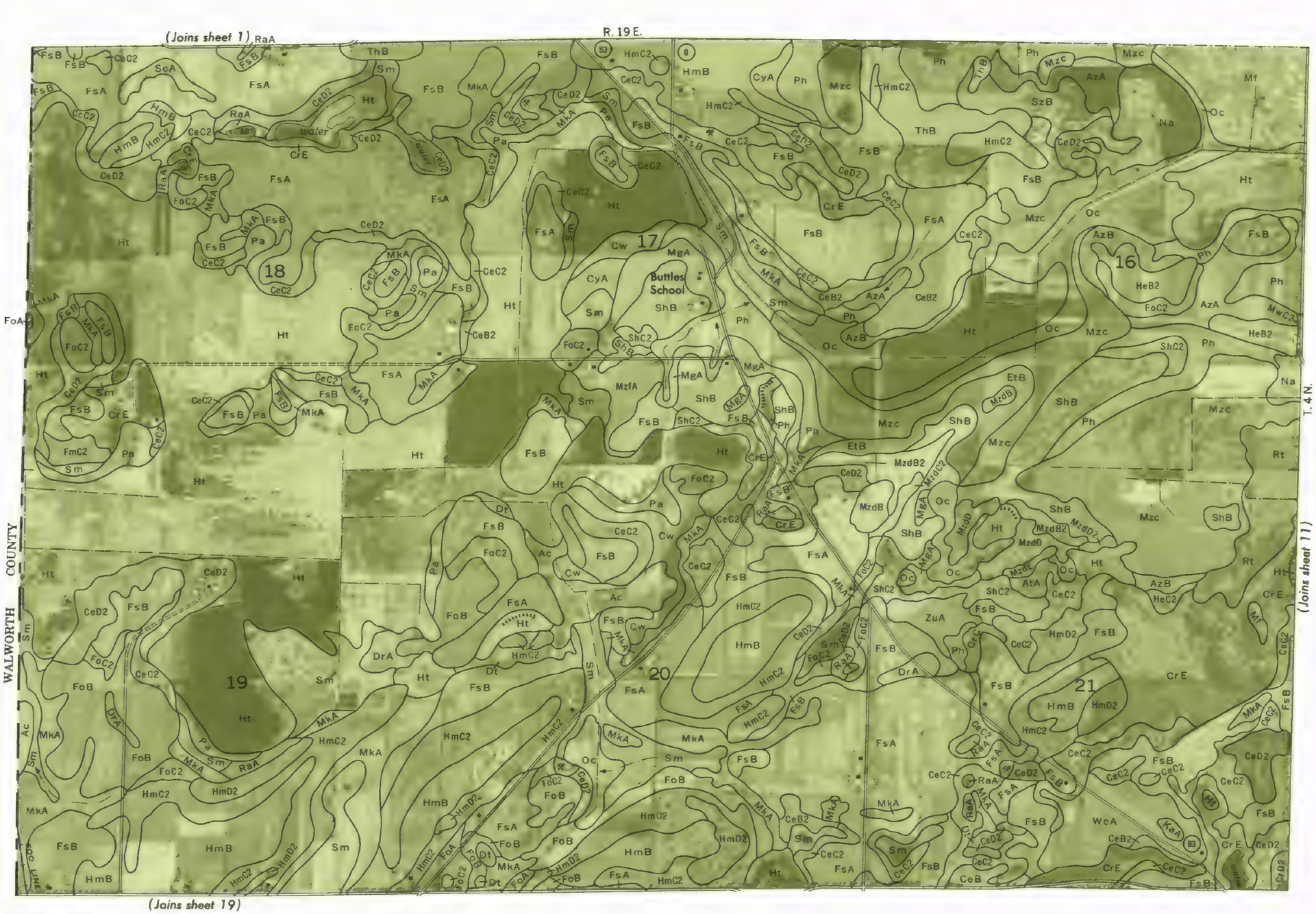
Land division corners are approximately positioned on this map.

1 ¾ ½ ¼ 0 1 Mile
5000 4000 3000 2000 1000 0 5000 Feet
Scale 1:15840



KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 10

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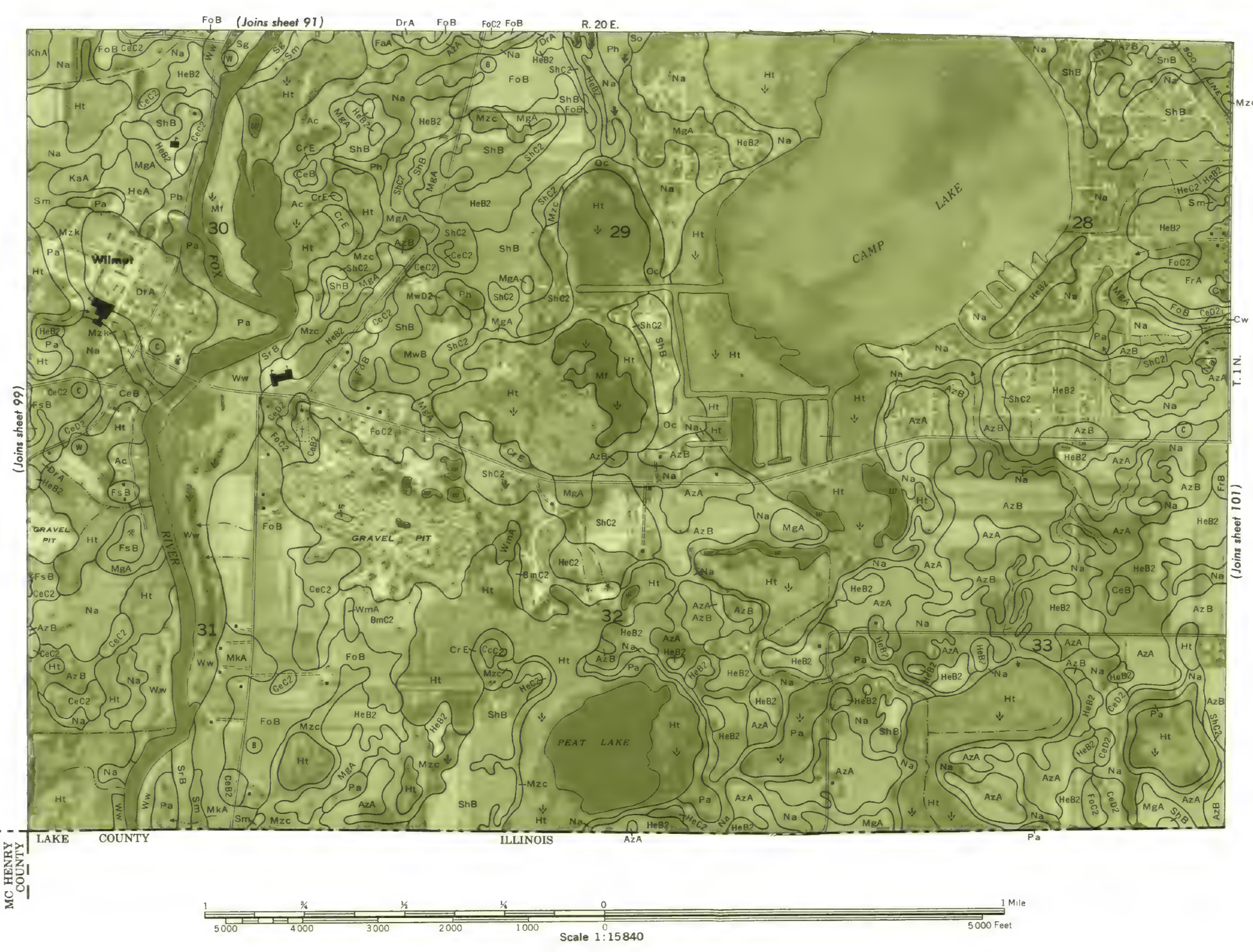

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 100

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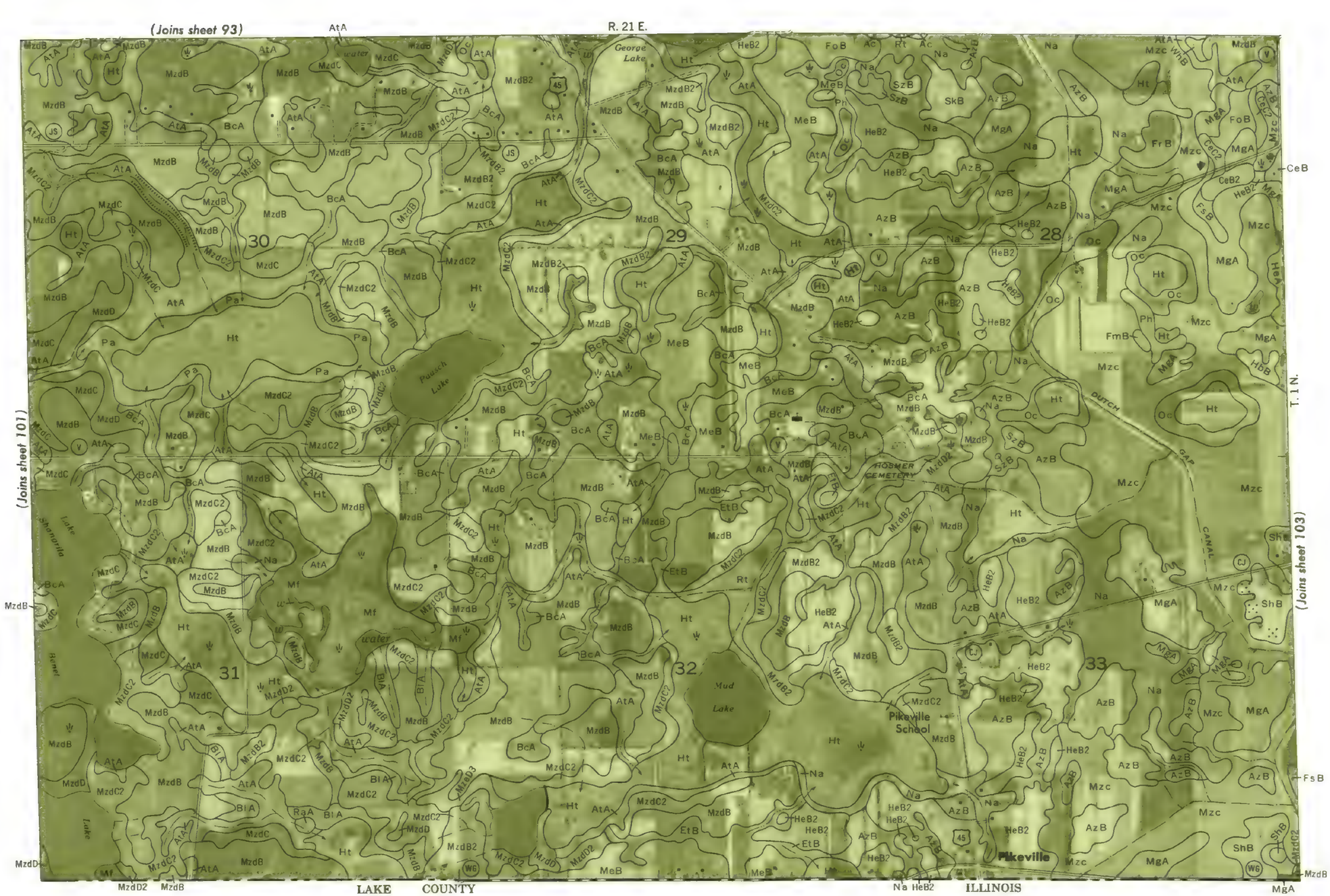
Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 101



1 ¾ ½ ¼ 0 1 Mile
5000 4000 3000 2000 1000 0 5000 Feet
Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 102

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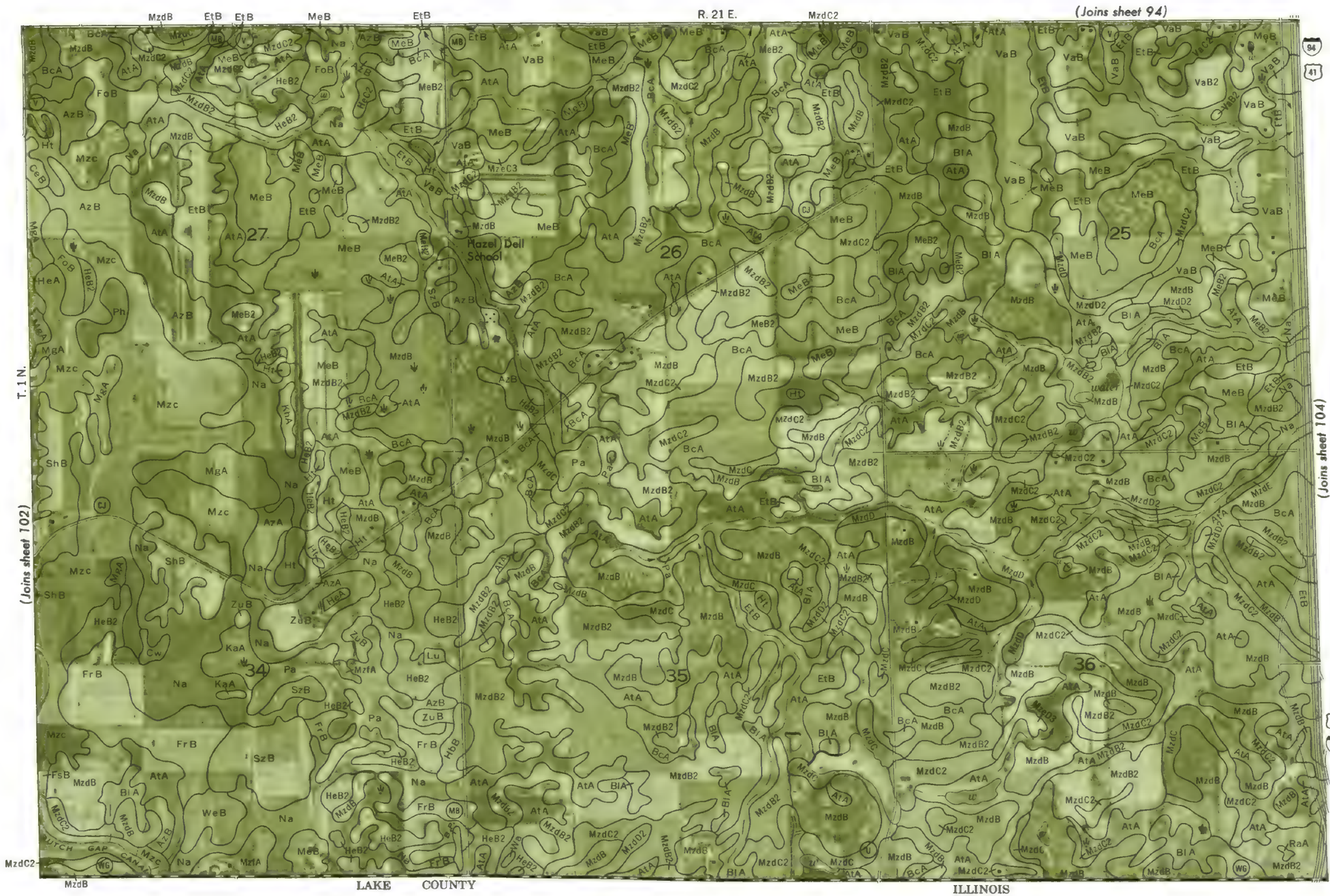
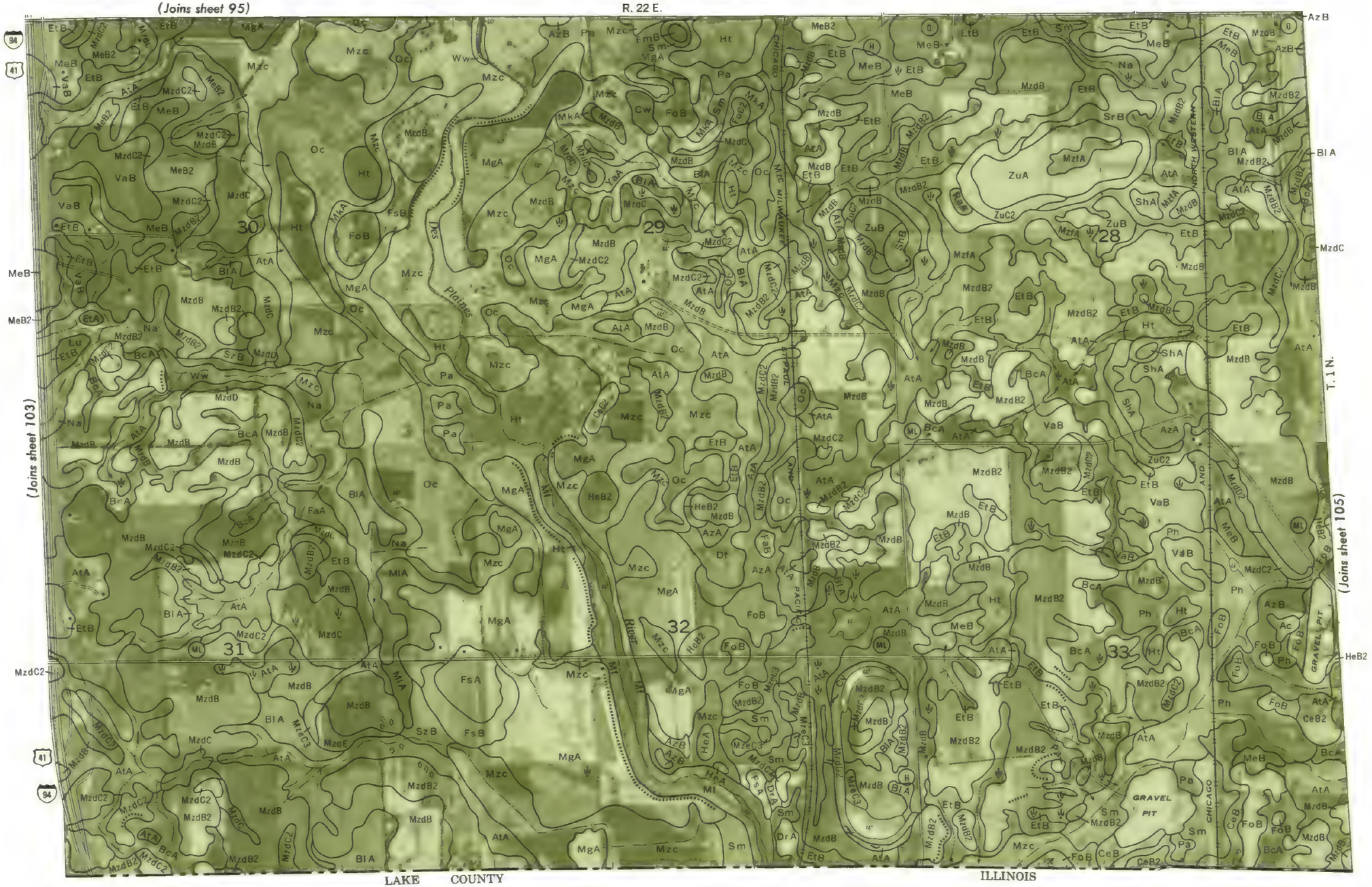
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 103





KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 104

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KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 11

1 Mile
5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 12

Land division corners are approximately positioned on this map.

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Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 13

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 14

Land division corners are approximately positioned on this map.

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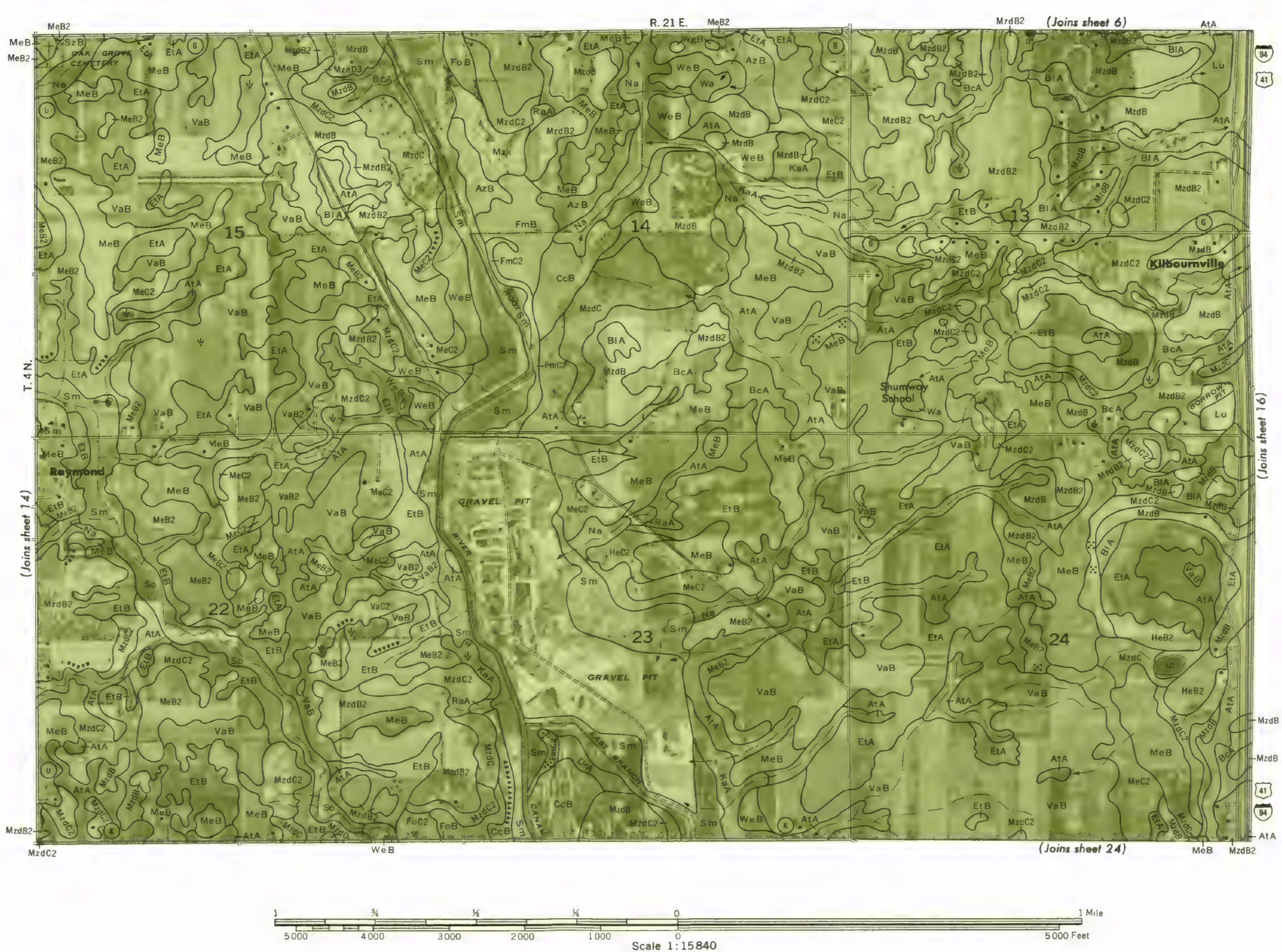
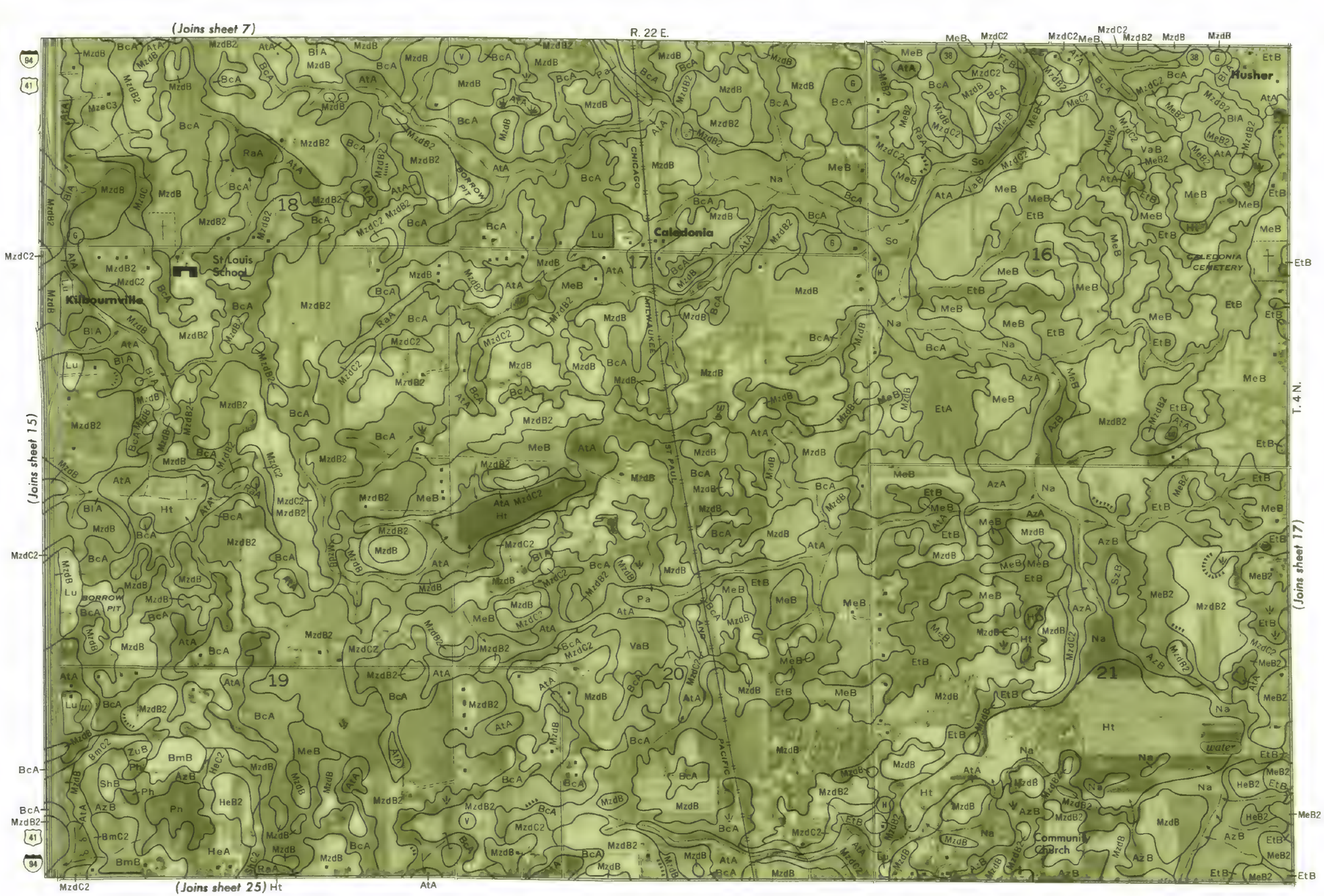
Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 15





1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 16

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department, and Wisconsin Agricultural Experiment Station.

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Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 17

1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 18

Land division corners are approximately positioned on this map.

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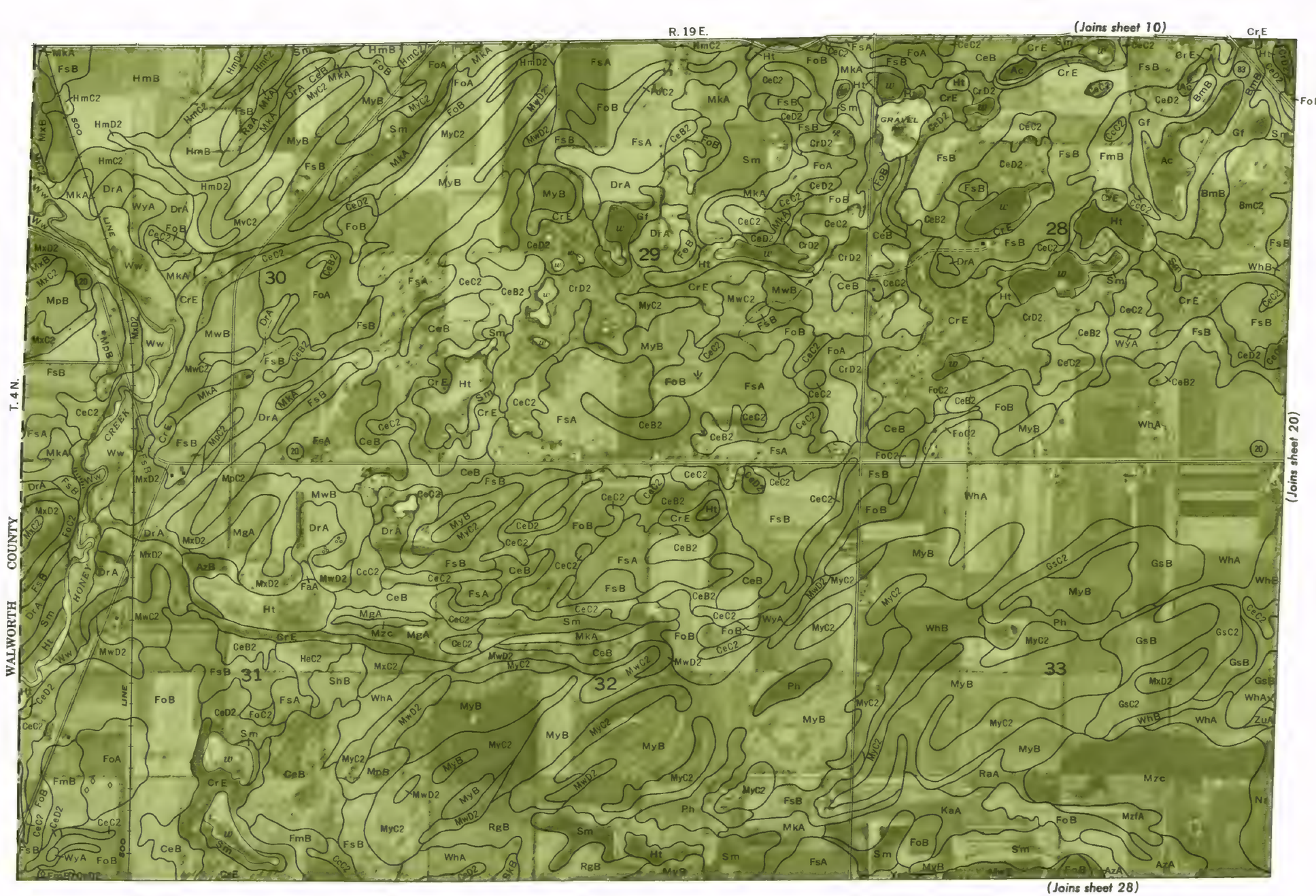
Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 19



1 Mile
5000 4000 3000 2000 1000 0 5000 Feet
Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 20

Land division corners are approximately positioned on this map.

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Land division corners are approximately positioned on this map.

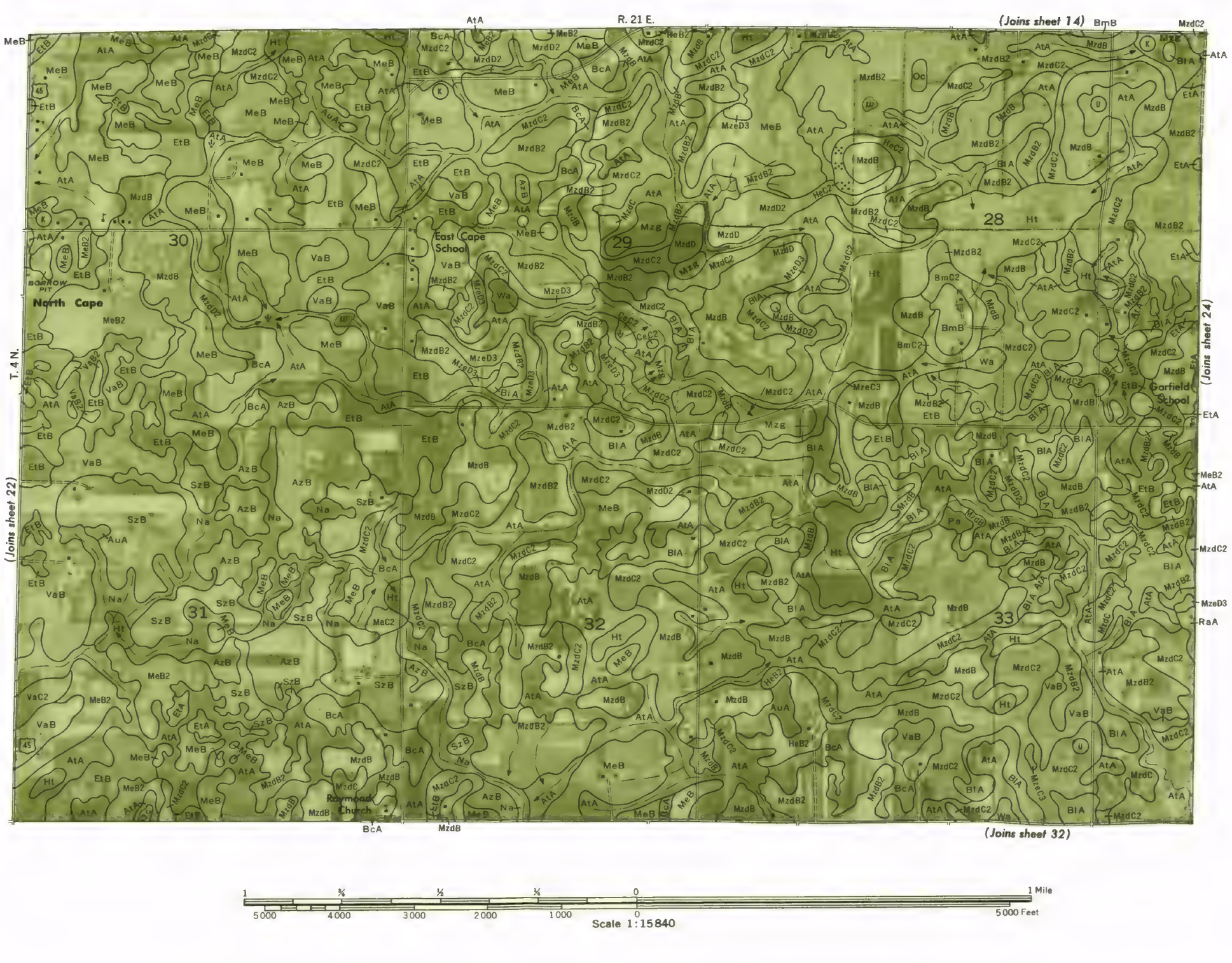
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 21

1 Mile
5000 4000 3000 2000 1000 0 5000 Feet
Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 22

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department, and Wisconsin Agricultural Experiment Station

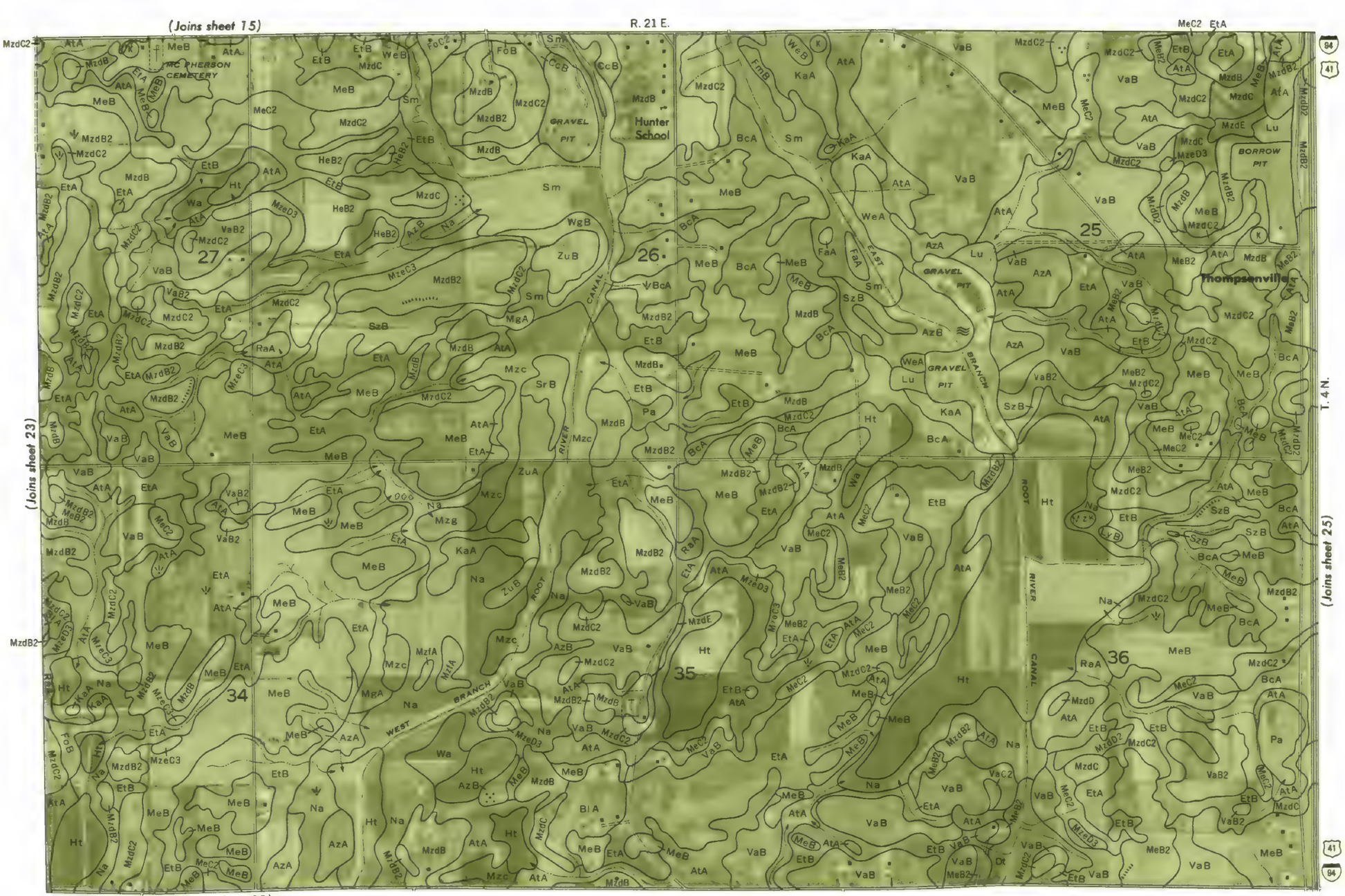


1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department, and Wisconsin Agricultural Experiment Station.
Land division corners are approximately positioned on this map.



1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 24

Land division corners are approximately positioned on this map.

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Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 25

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 26

Land division corners are approximately positioned on this map.

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Land division corners are approximately positioned on this map.

1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 28

Land division corners are approximately positioned on this map.

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Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 29

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 30

Land division corners are approximately positioned on this map.

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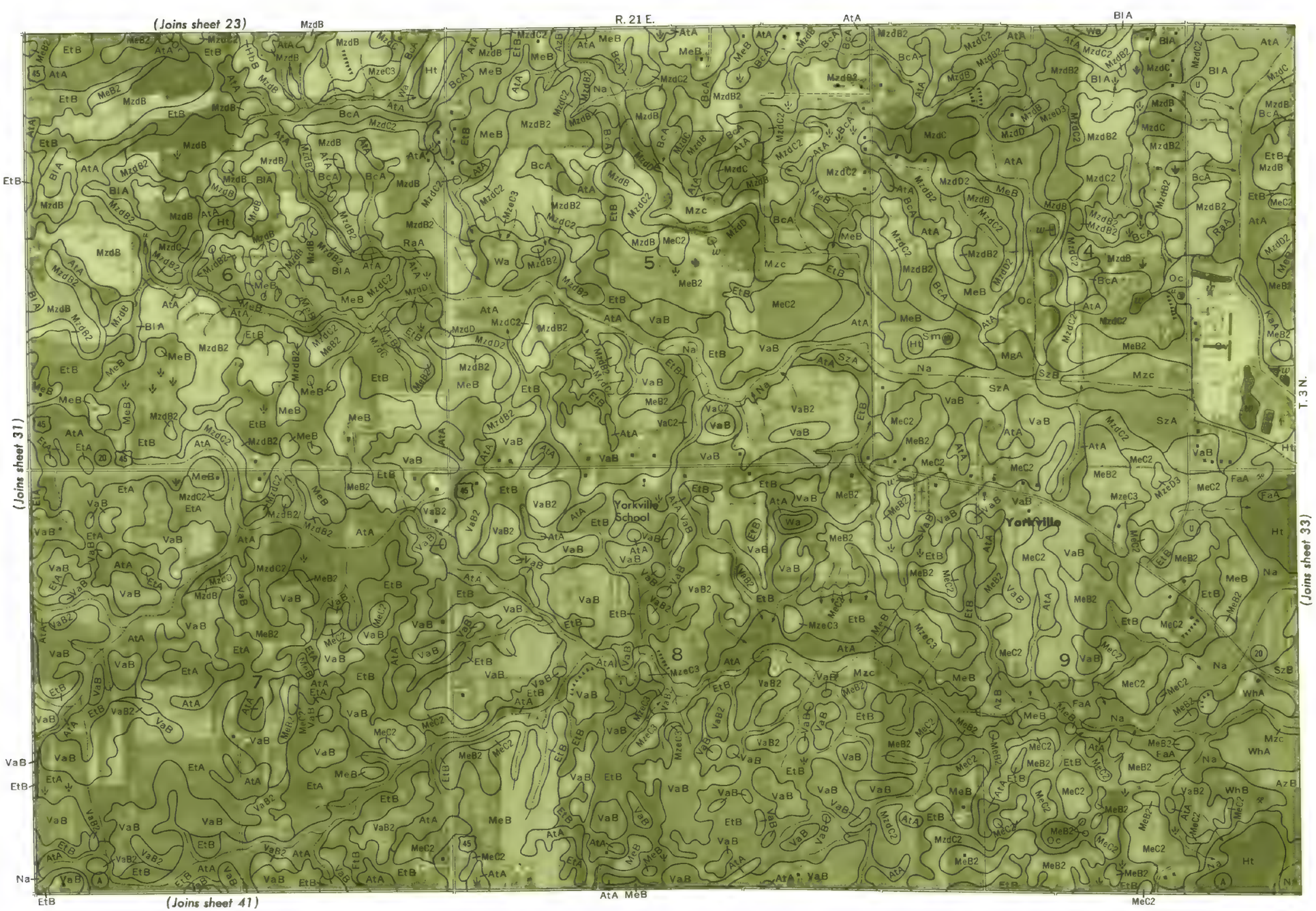
Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 31



KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 32

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department, and Wisconsin Agricultural Experiment Station.

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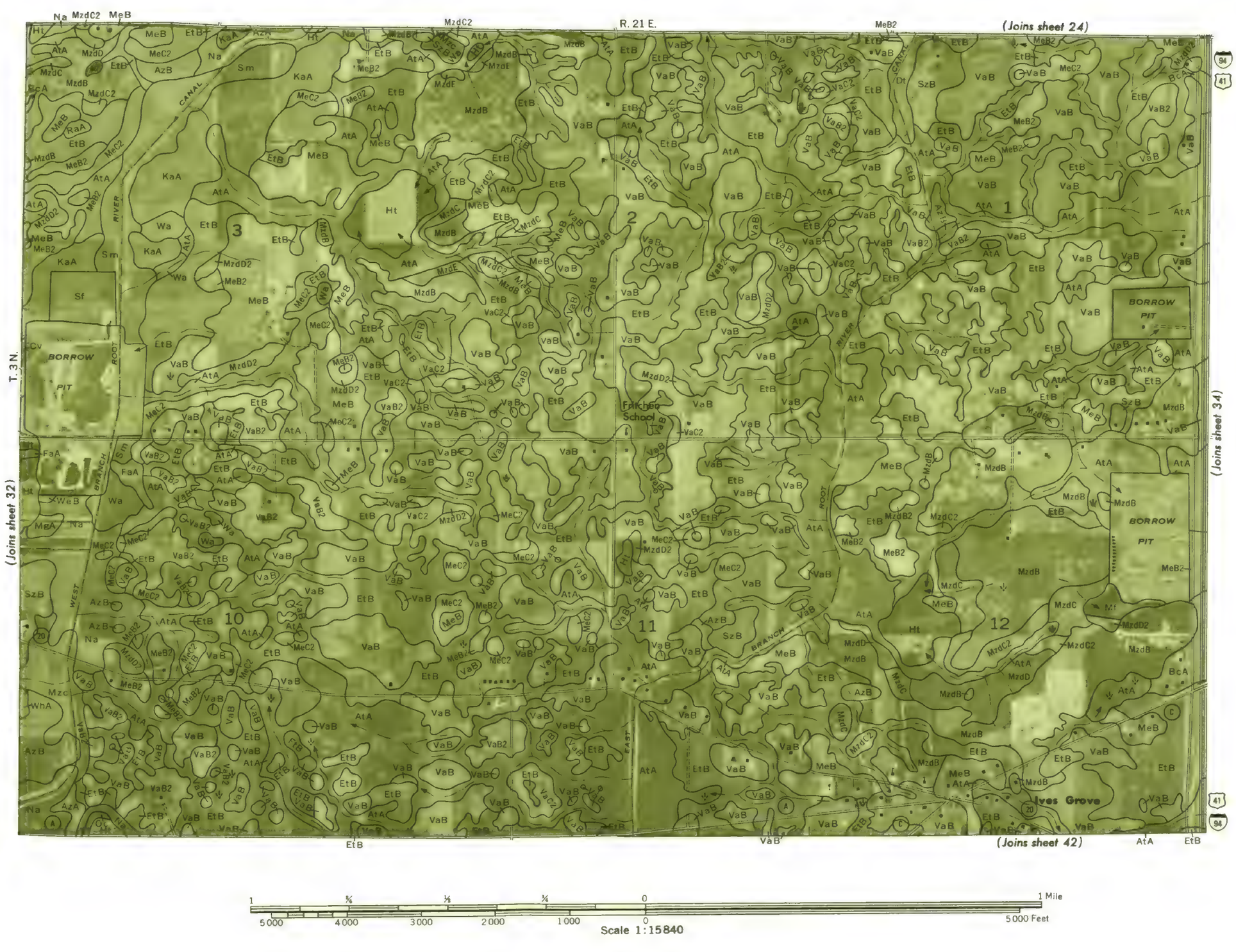
Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 33



1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 34

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department, and Wisconsin Agricultural Experiment Station.

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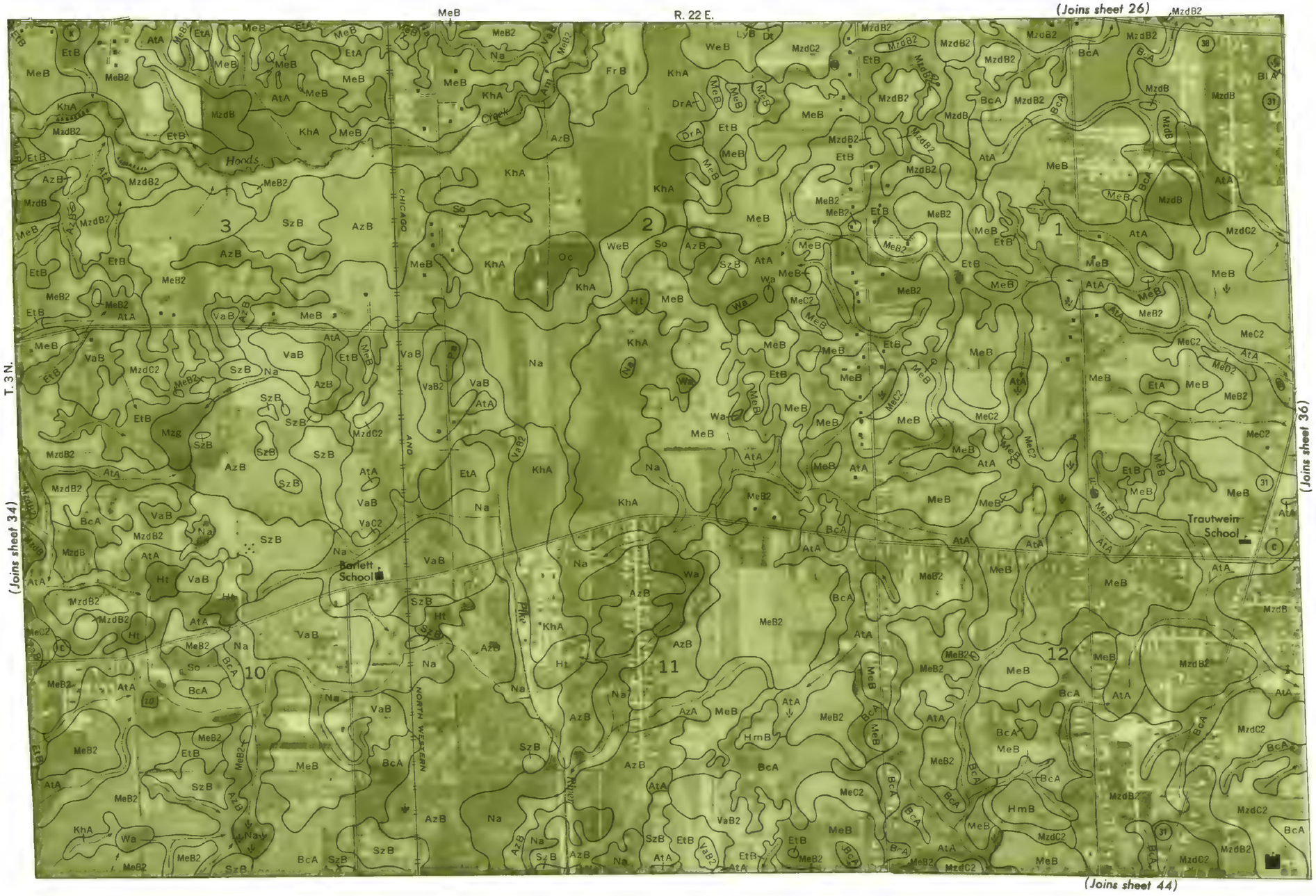
Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 35



N

(Joins sheet 27)

R. 23 E.

T. 3 N.

(Joins sheet 35)

(Joins sheet 45)

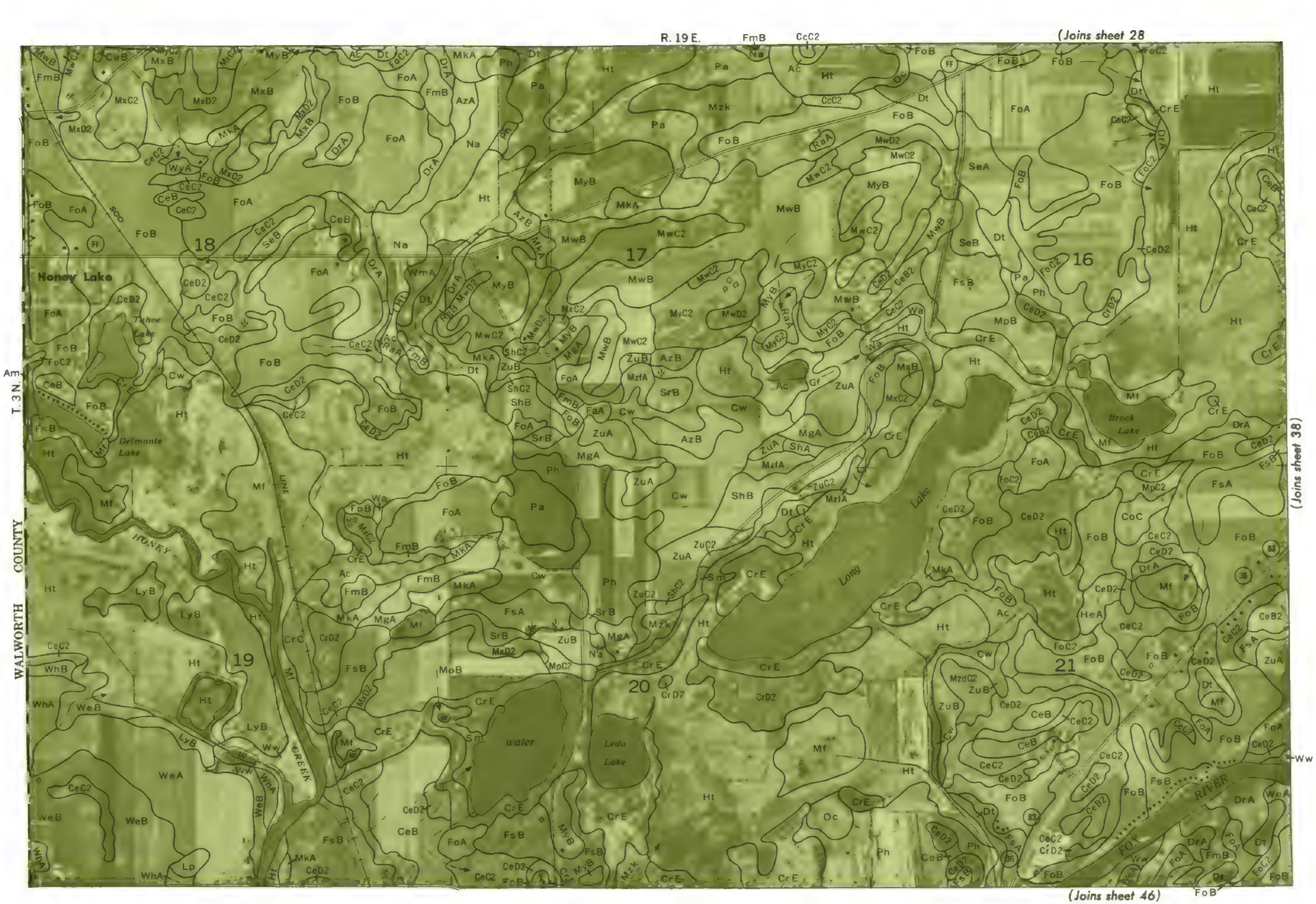
Rapids School
Beacon Light Chapel
Wadewitz School
Horlick High School
Emmaus Church
Canary Church
Theodore Roosevelt School
Trinity Church & School
RACINE (county seat)
St John Church
Emmanuel Church
Washington School
St James School
German Church
Providence Church
Grace Church
St Patricks School
Garfield School
Lincoln School
St Stephan Church
Sacred Heart School
Wyman Church
Jefferson School
McKinley School
Bethel Church
MEADOWBROOK COUNTRY CLUB
RAINB COUNTRY CLUB
GRACELAND CEMETERY
DUMP
ROOT RIVER
CHICAGO AND NORTH WESTERN
LAKE MICHIGAN

1 ¾ ½ ¼ 0 1 Mile
5000 4000 3000 2000 1000 0 5000 Feet
Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 36

I and division corners are approximately positioned on this map.

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, So is Department, and Wisconsin Agricultural Experiment Station.



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Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 37

1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 38

Land division corners are approximately positioned on this map

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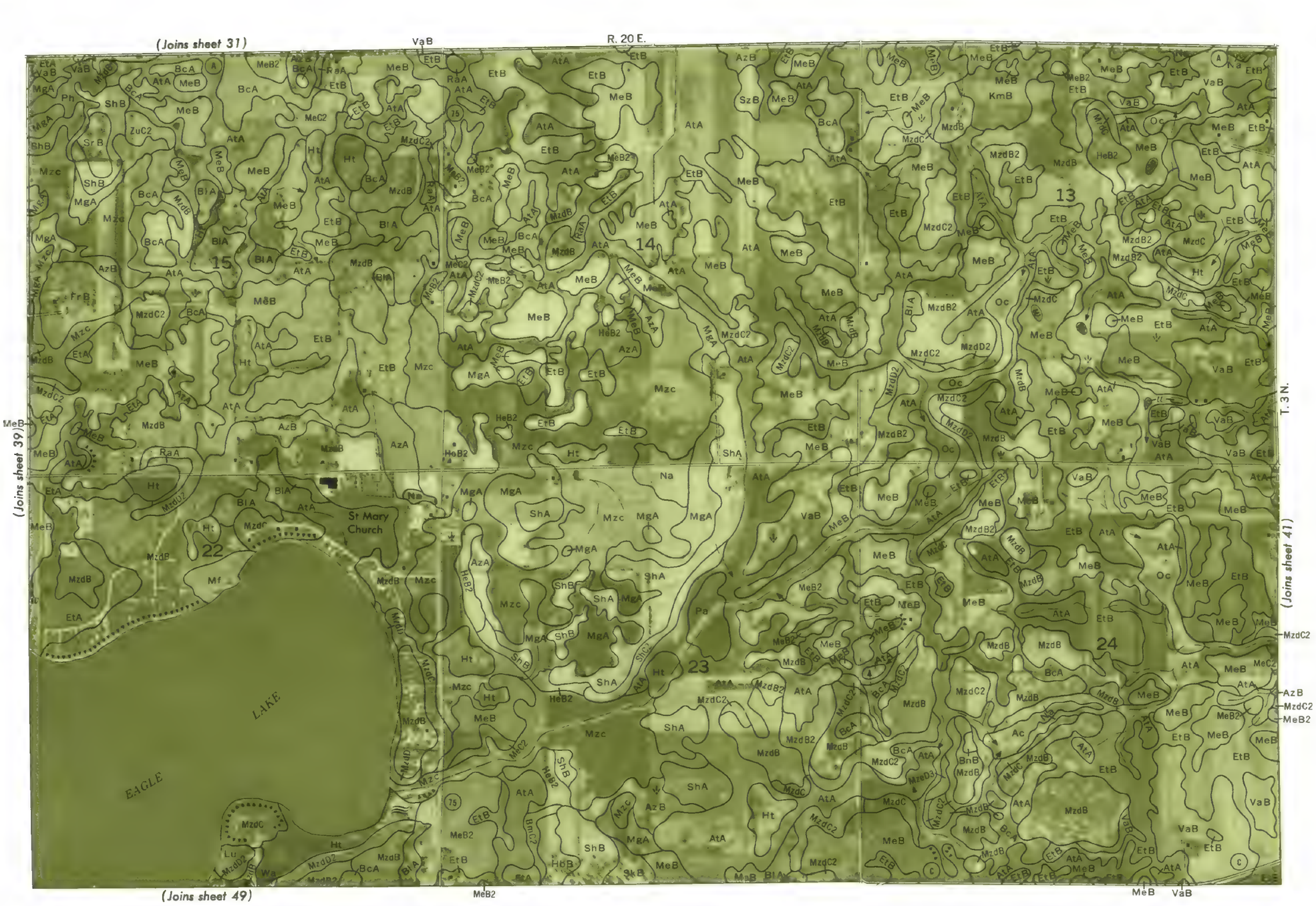
Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 39



1 Mile
5000 4000 3000 2000 1000 0 5000 Feet
Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 40

Land division corners are approximately positioned on this map

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department; and Wisconsin Agricultural Experiment Station.

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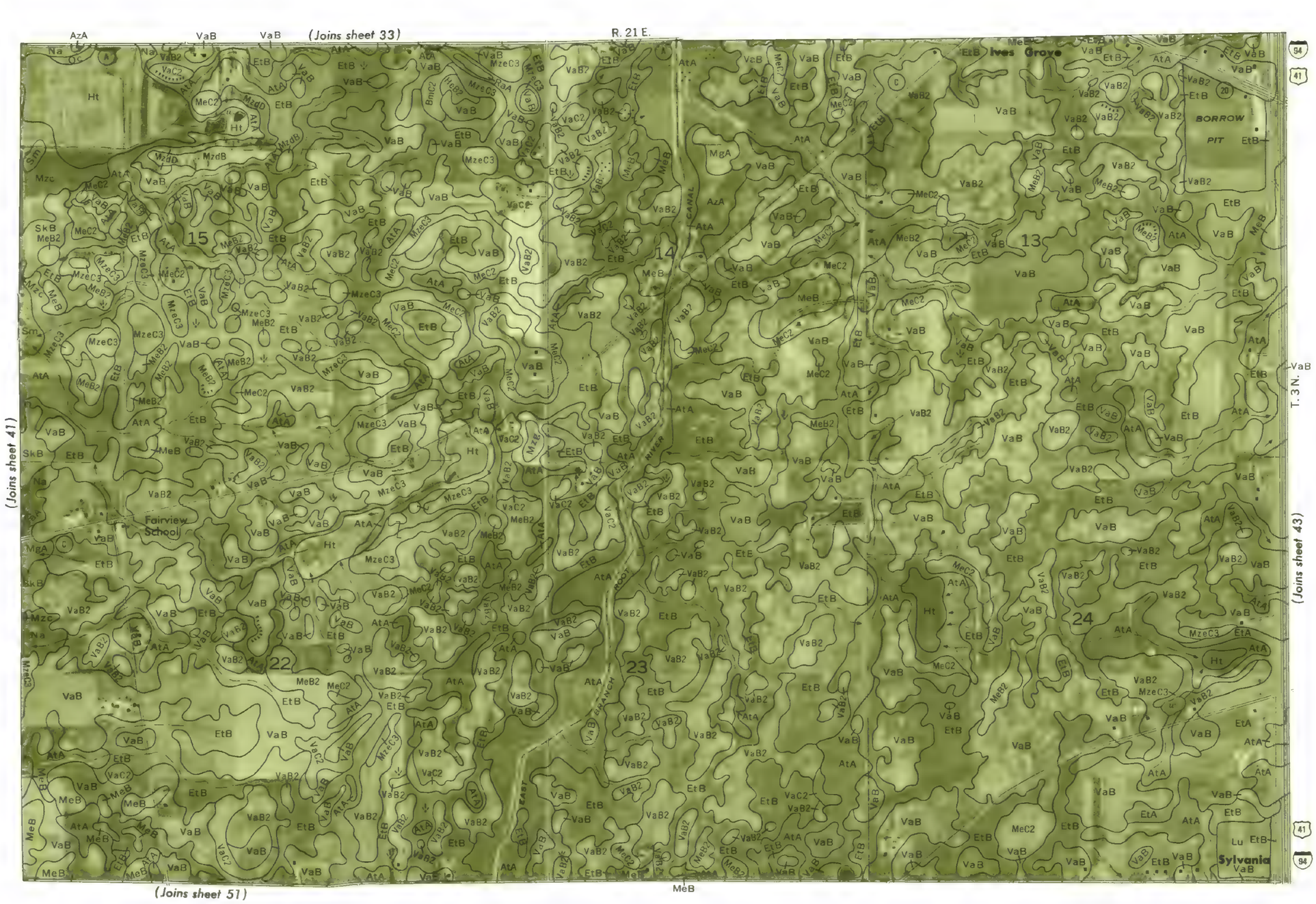

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 42

Land division corners are approximately positioned on this map

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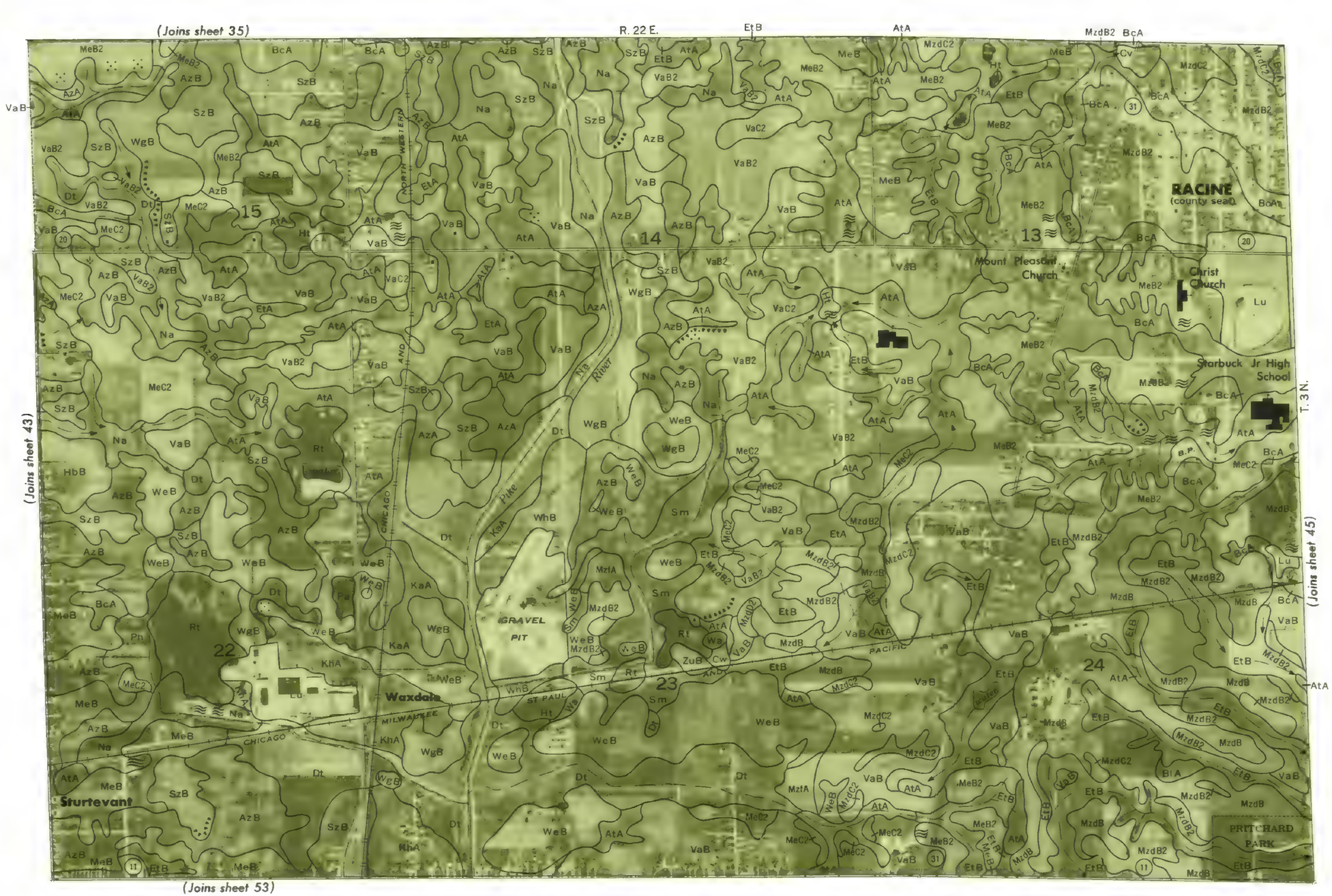
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 43



1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 44

Land division corners are approximately positioned on this map

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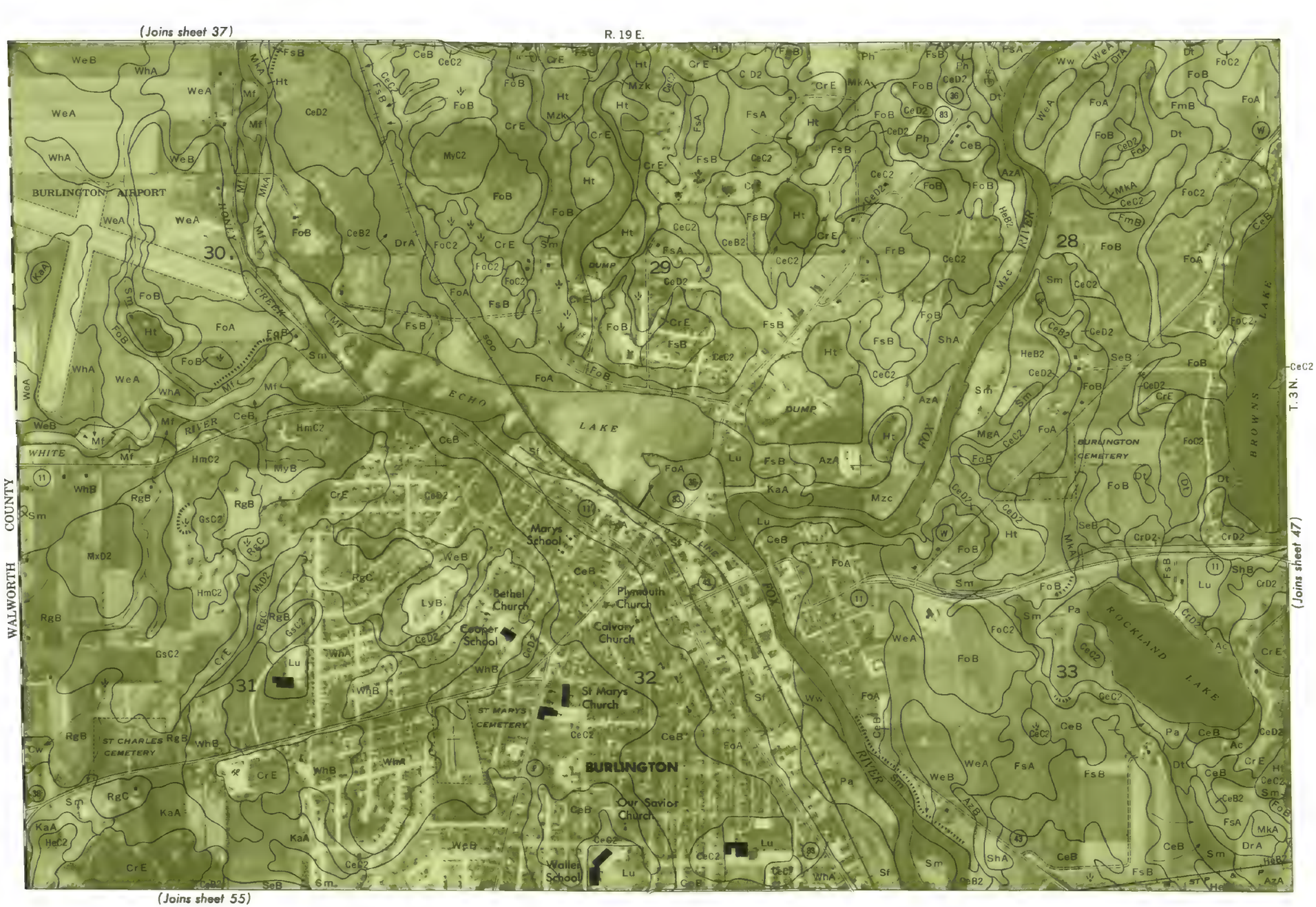
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 45



KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 46

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department, and Wisconsin Agricultural Experiment Station.

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Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO 47

1 Mile
5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 48

Land division corners are approximately positioned on this map.

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KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 49

1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 50

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department, and Wisconsin Agricultural Experiment Station.

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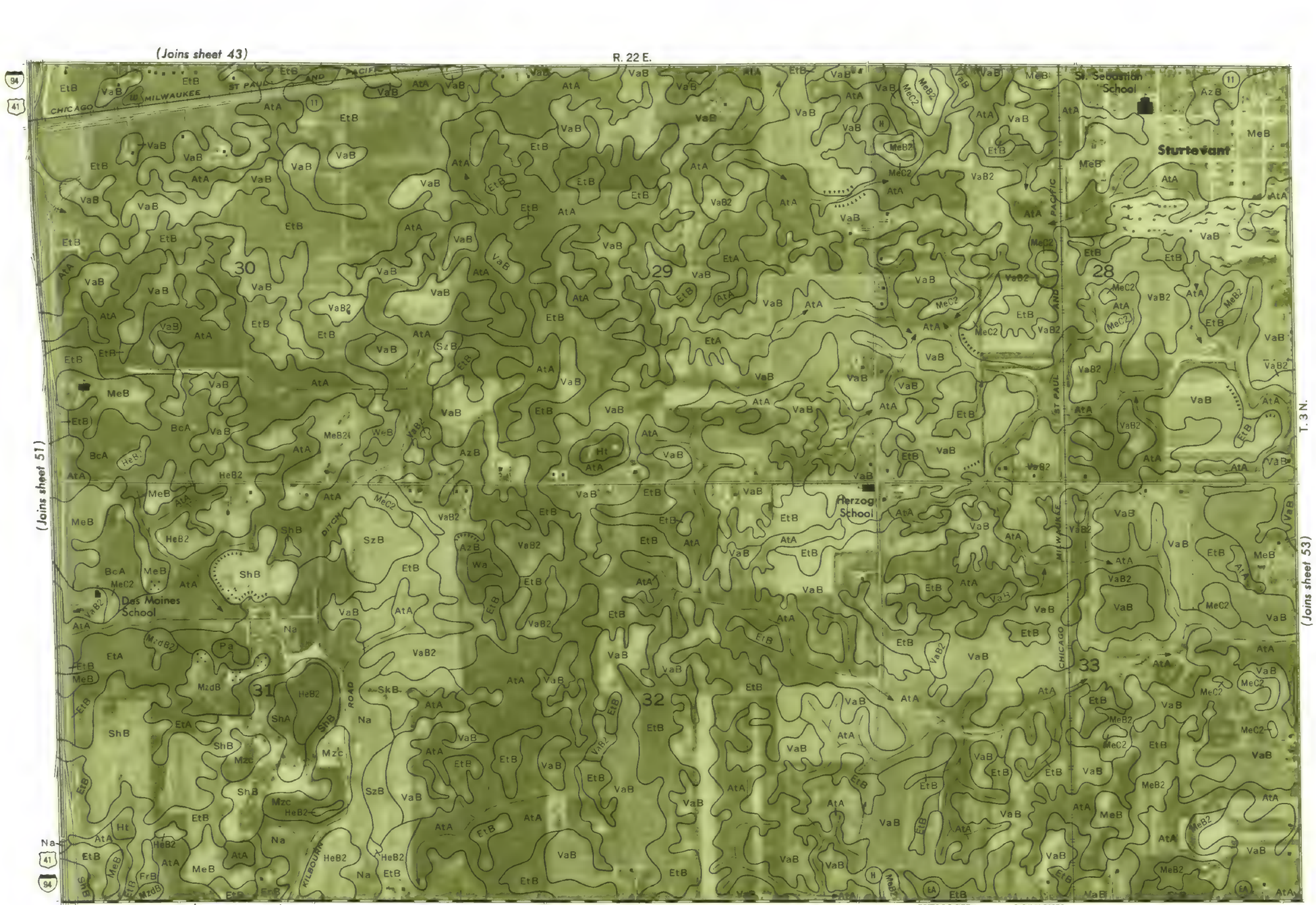


1 ¾ ½ ¼ 0 1 Mile

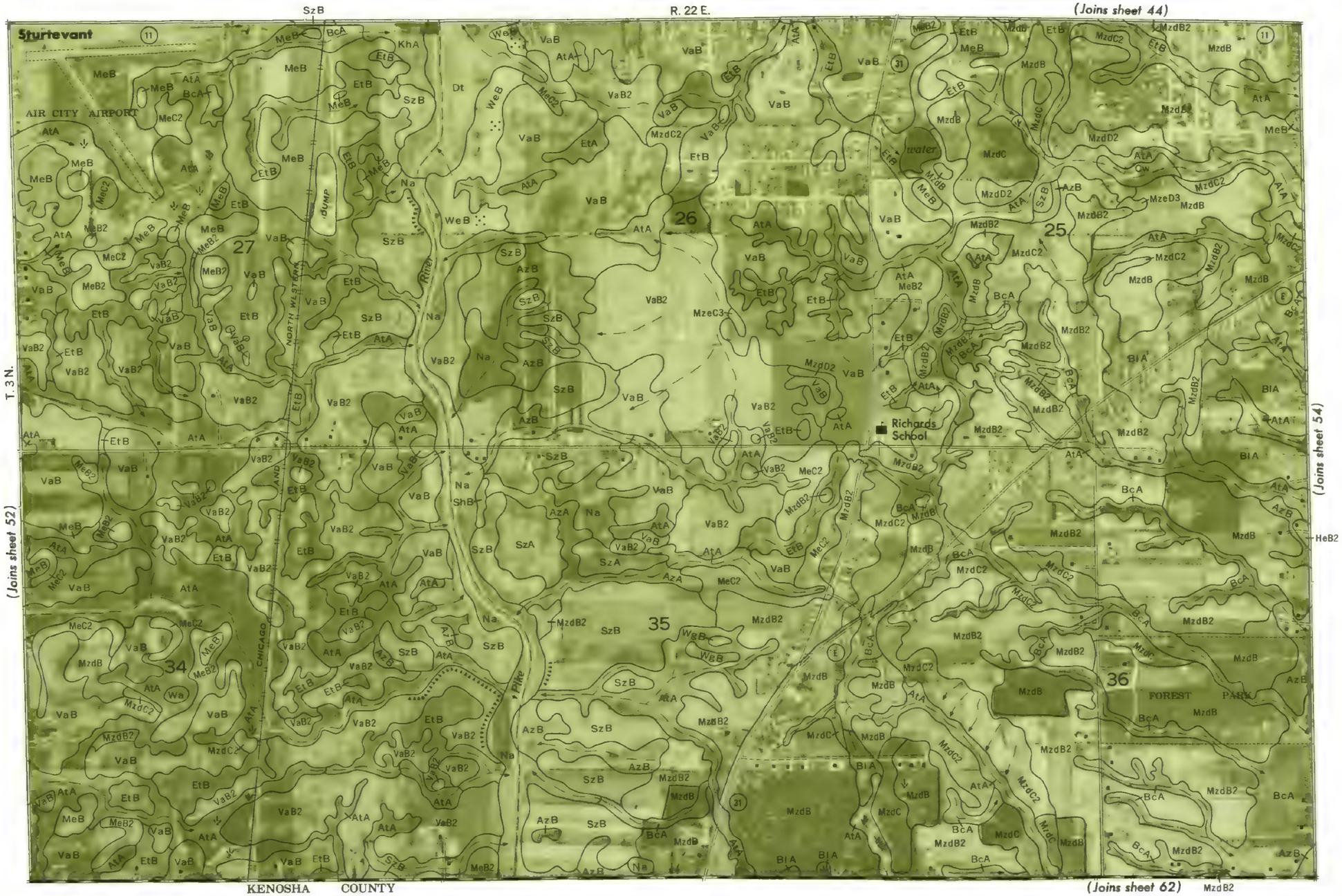
5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 52

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department, and Wisconsin Agricultural Experiment Station.



This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department, and Wisconsin Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 54

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department, and Wisconsin Agricultural Experiment Station.

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Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 55

1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 56

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department, and Wisconsin Agricultural Experiment Station

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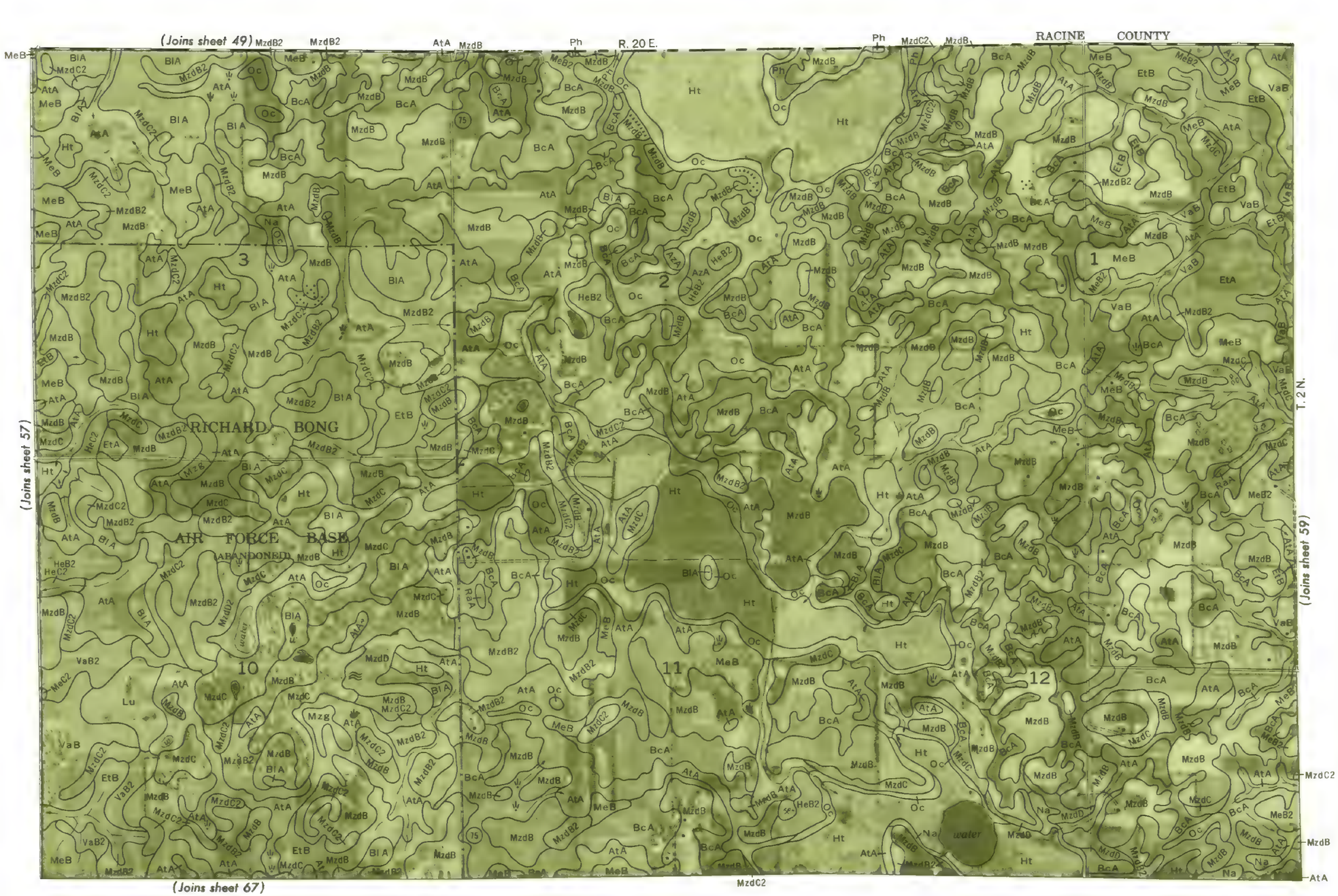
Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 57



1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 58

Land division corners are approximately positioned on this map

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department, and Wisconsin Agricultural Experiment Station.

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Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 59

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 60

Land division corners are approximately positioned on this map.

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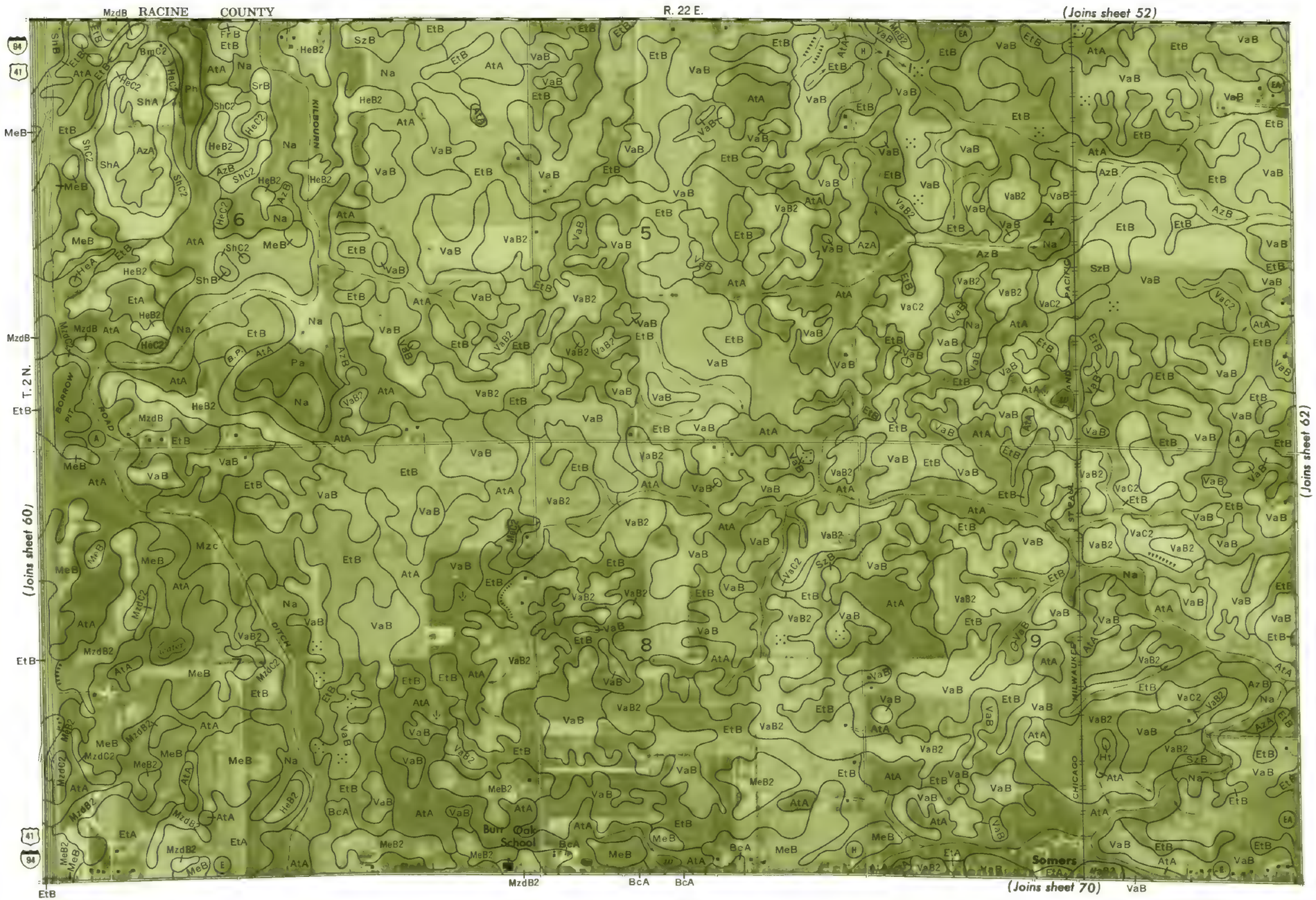
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 61



1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 62

Land division corners are approximately positioned on this map.

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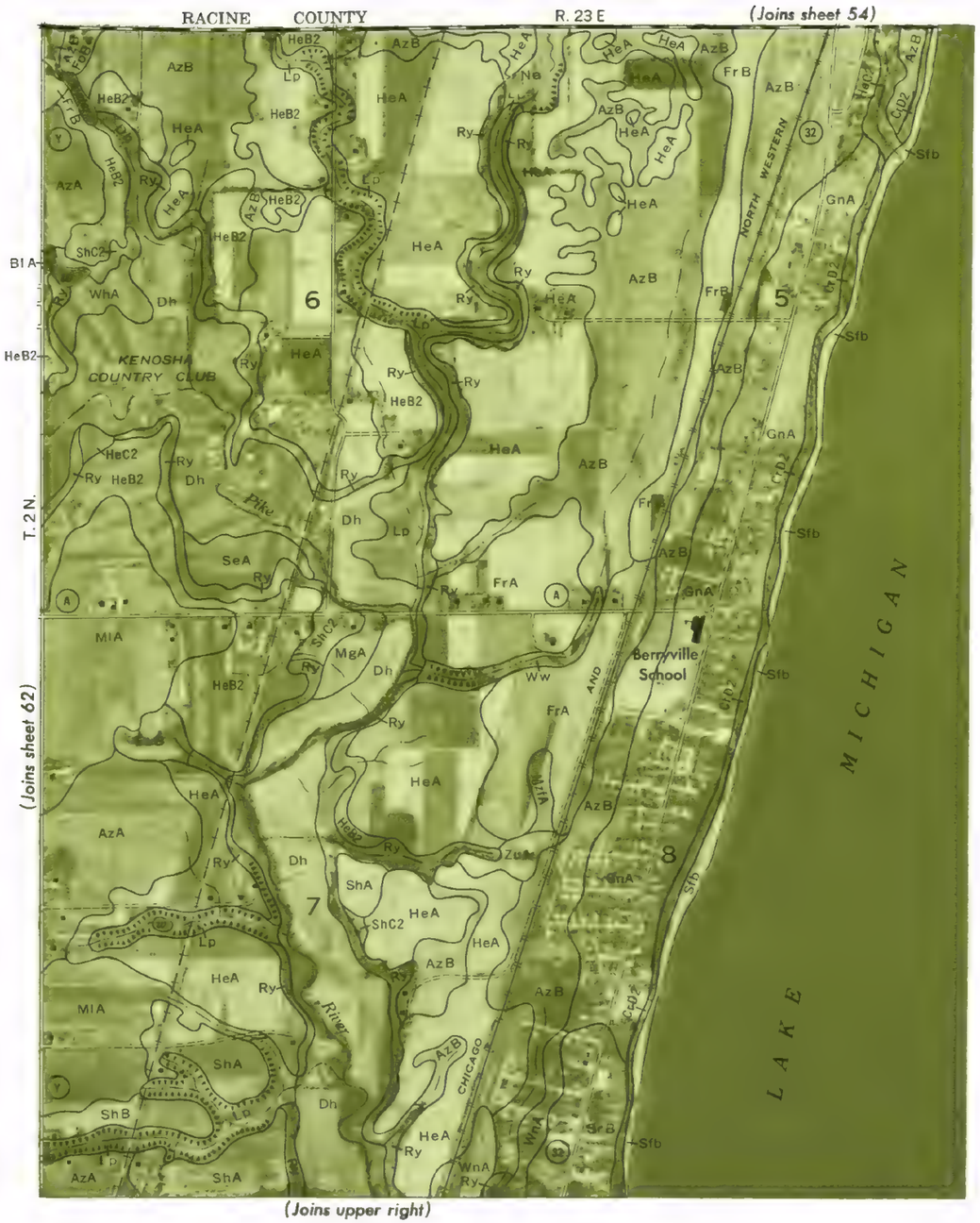
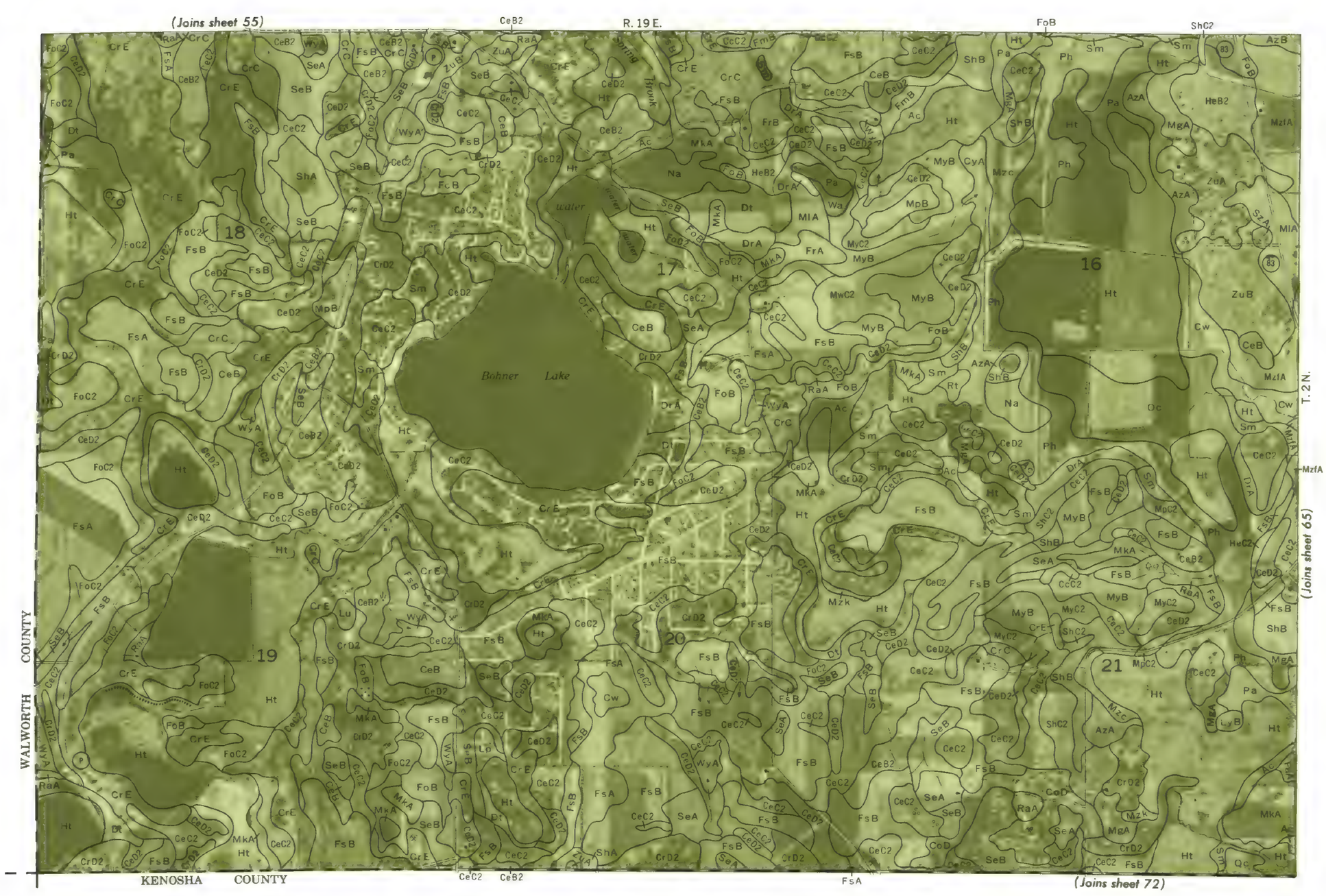
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 63



N

1 ¾ ½ ¼ 0 1 Mile
5000 4000 3000 2000 1000 0 5000 Feet
Scale 1:15840



KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 64

Land division corners are approximately positioned on this map.

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KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 65

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 66

Land division corners are approximately positioned on this map.

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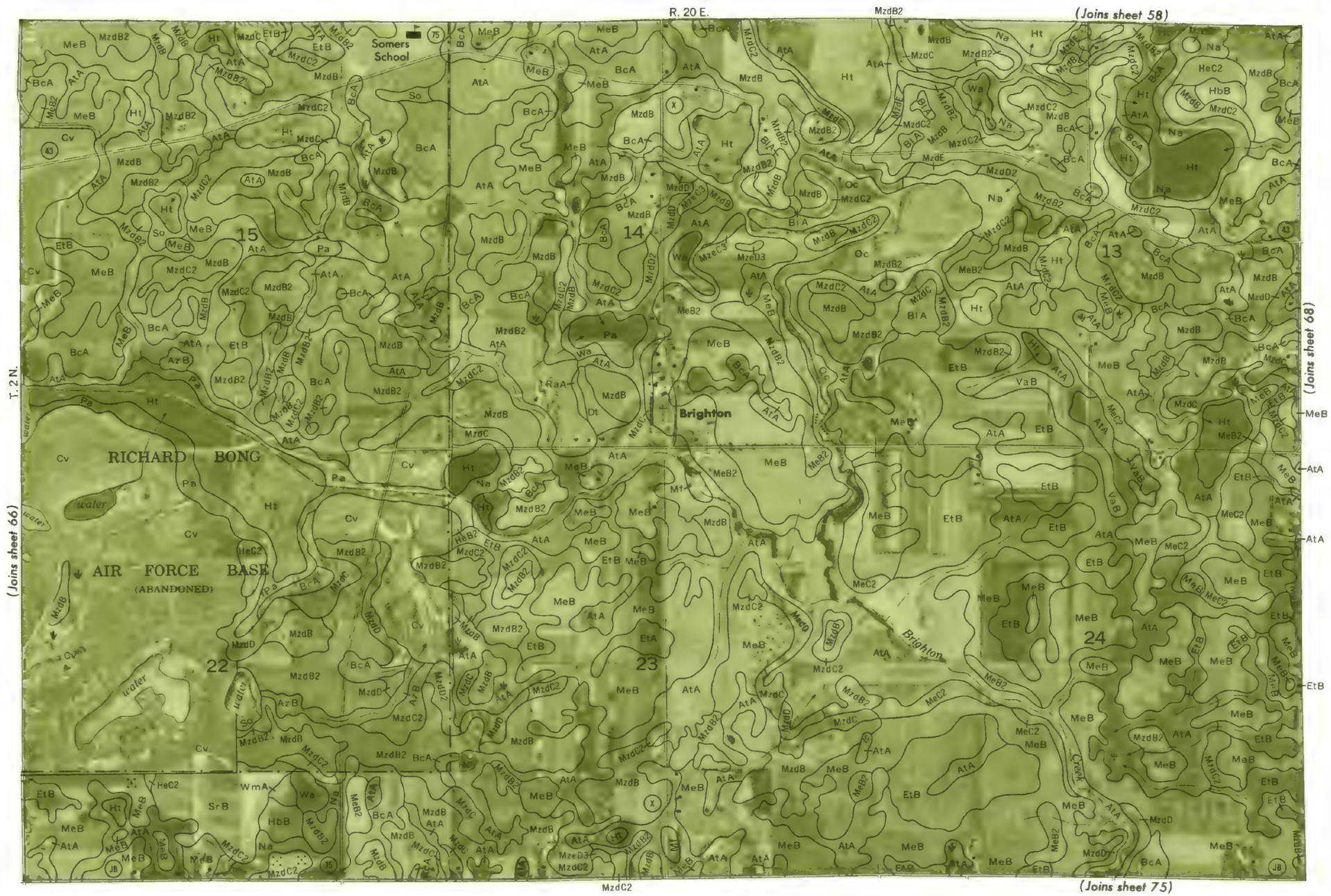
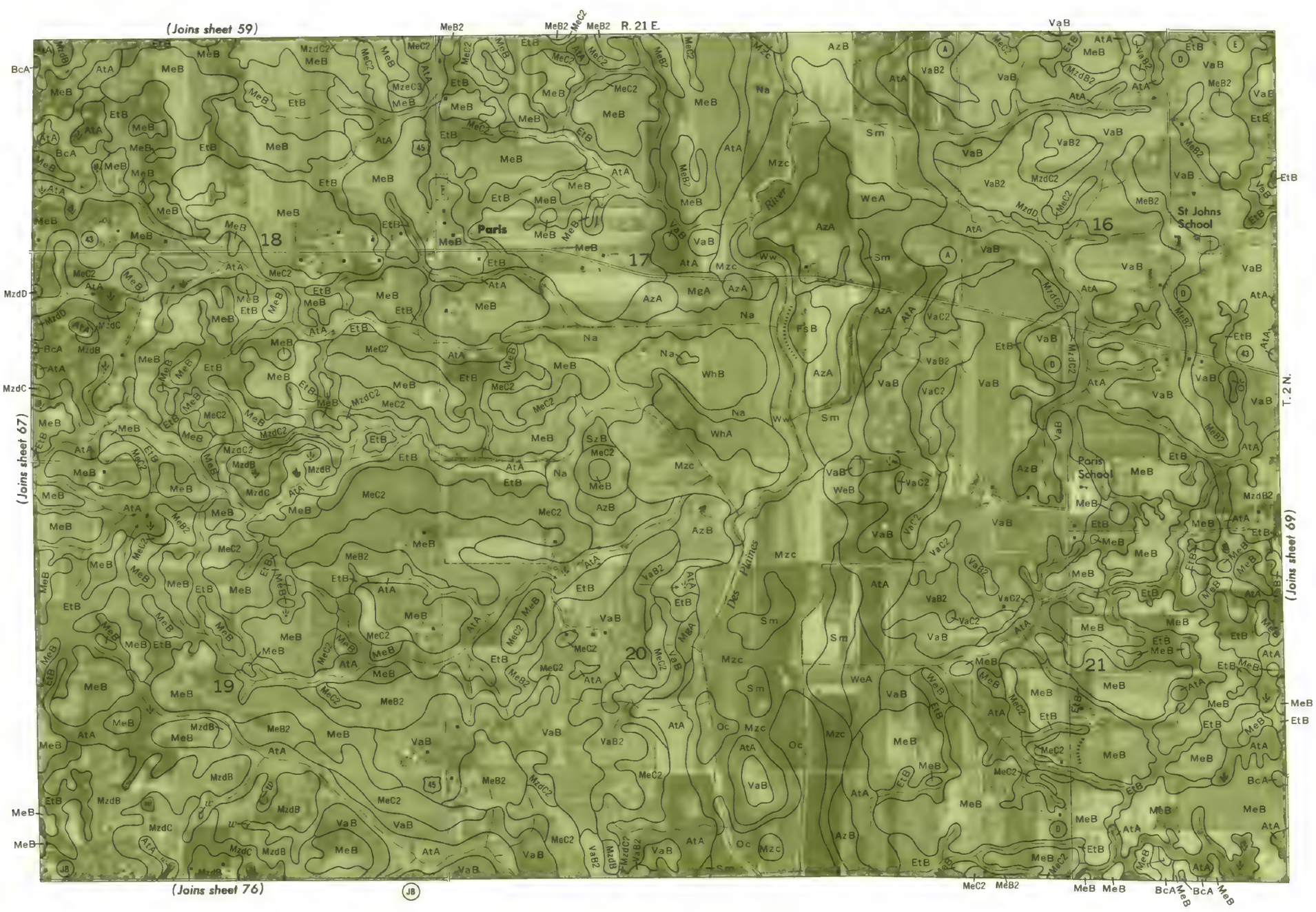
Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 67





KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 68

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department, and Wisconsin Agricultural Experiment Station.

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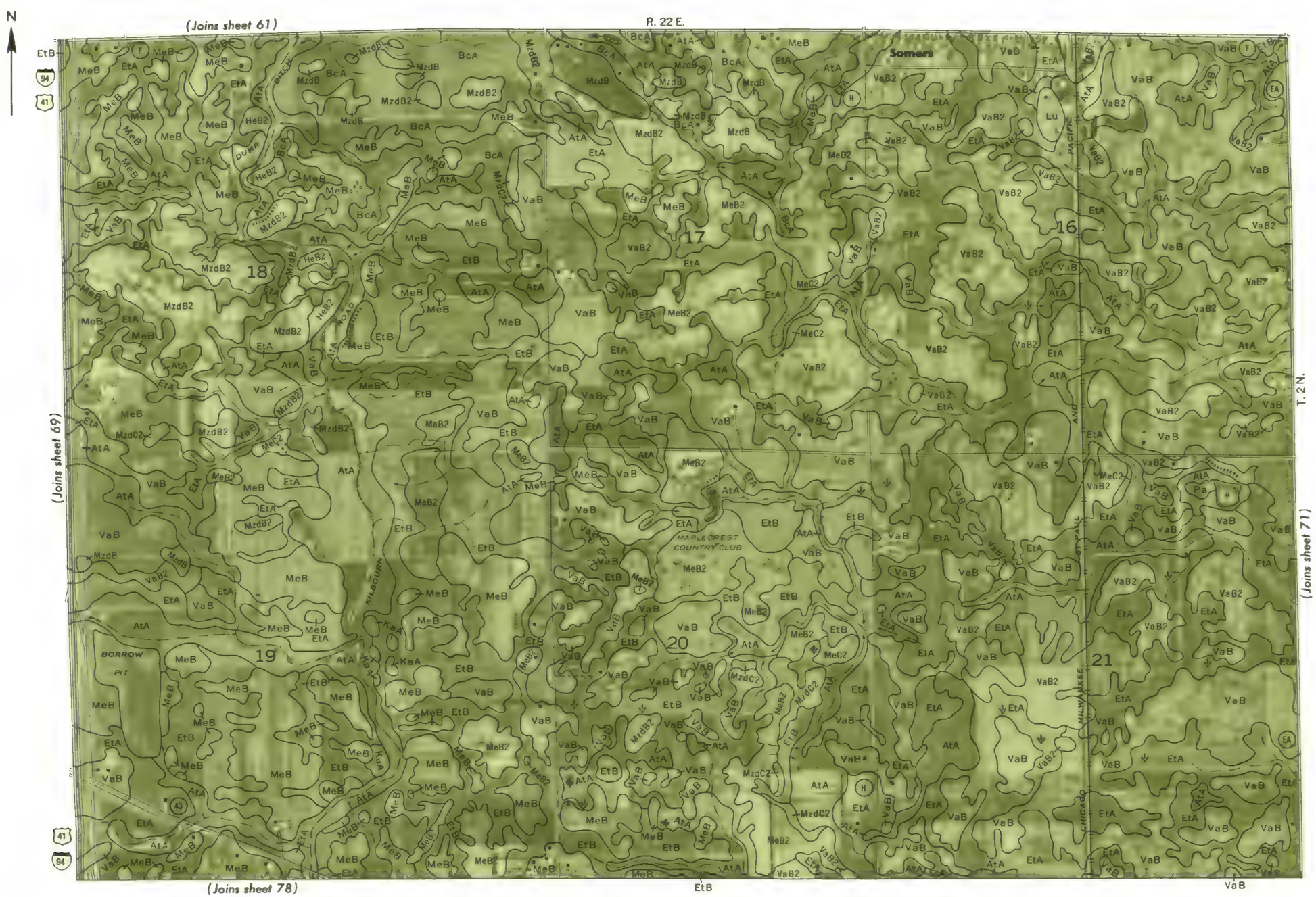

1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 70

Land division corners are approximately positioned on this map.

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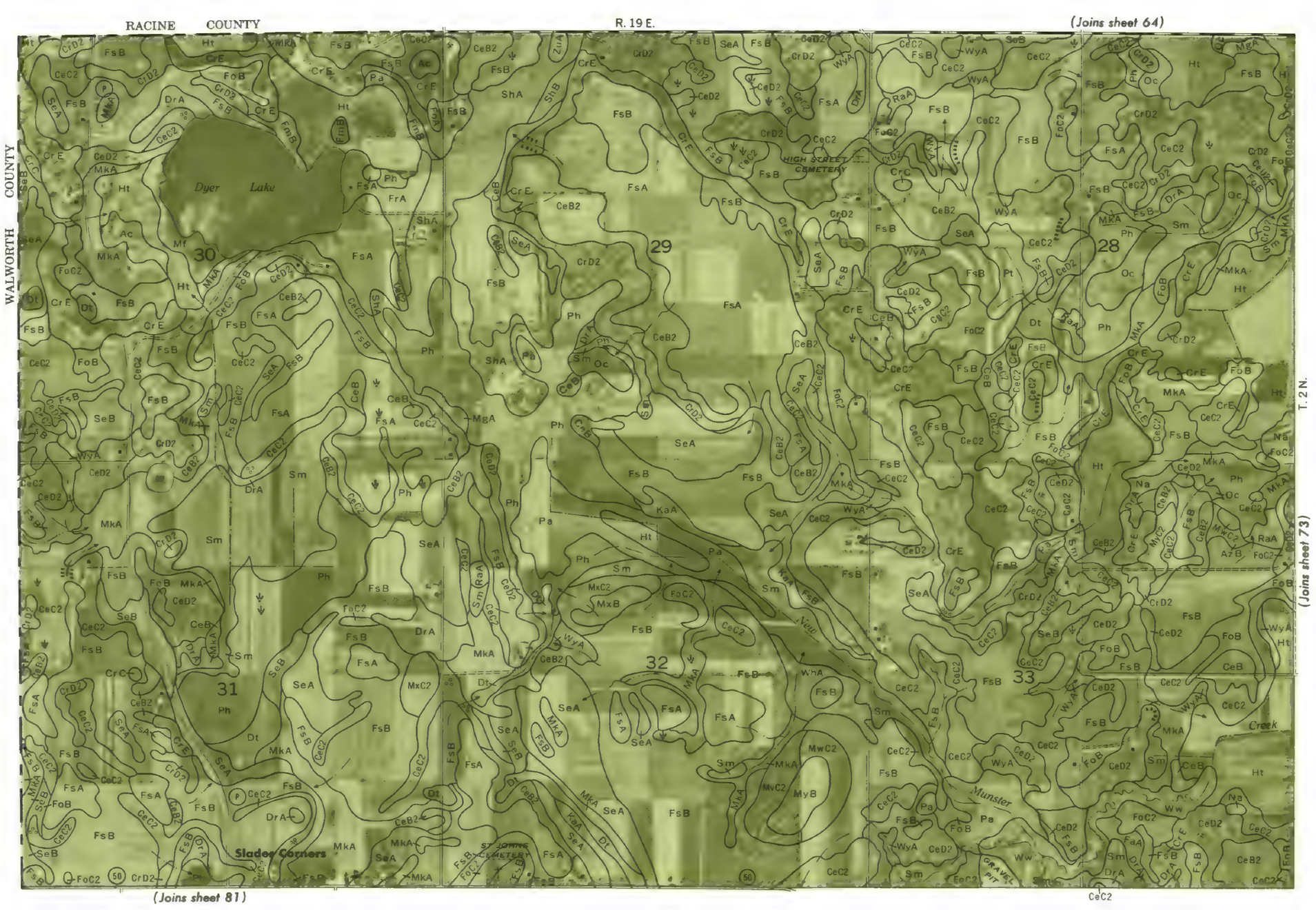
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 71



KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 72

Land division corners are approximately positioned on this map.

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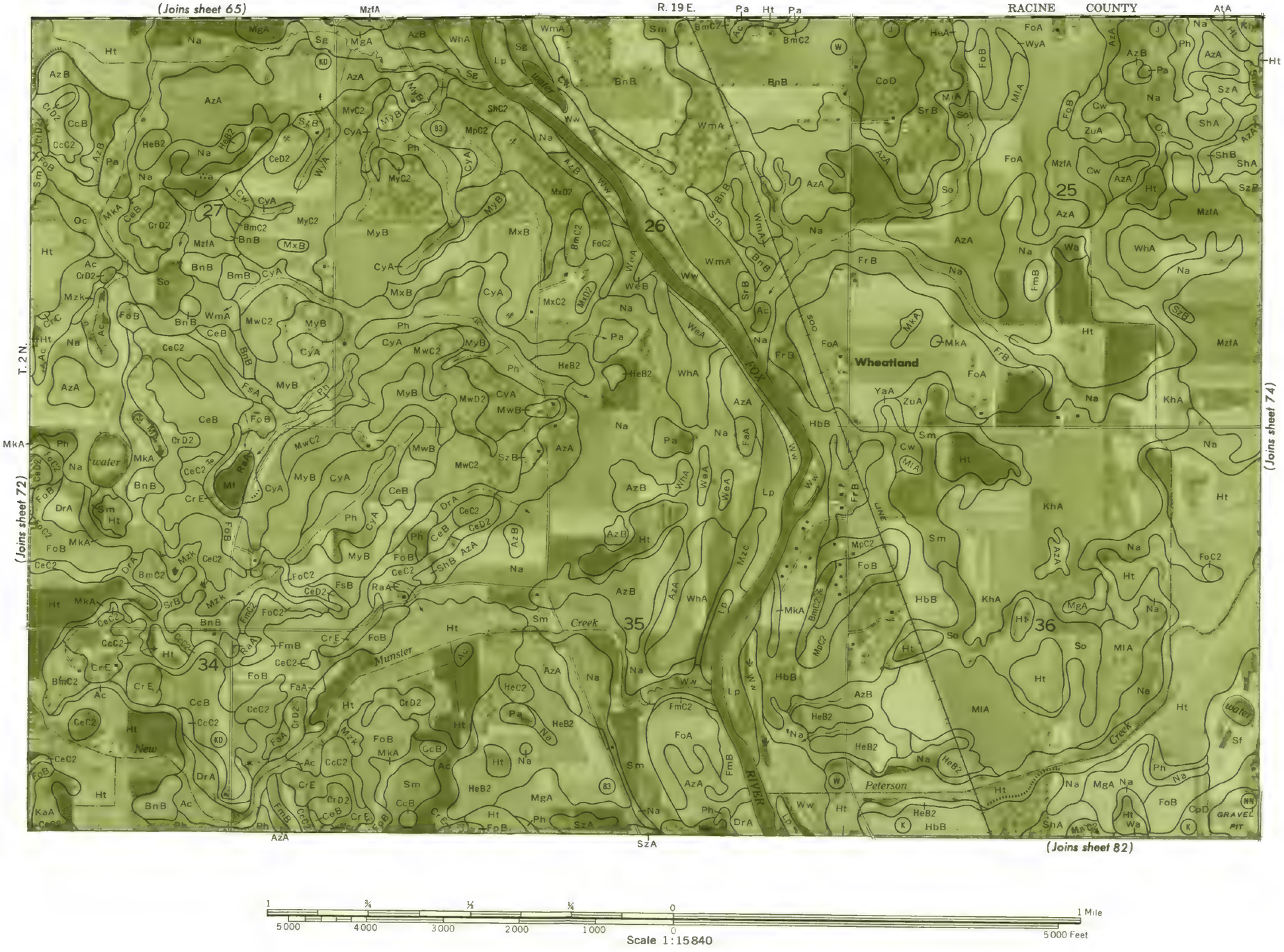
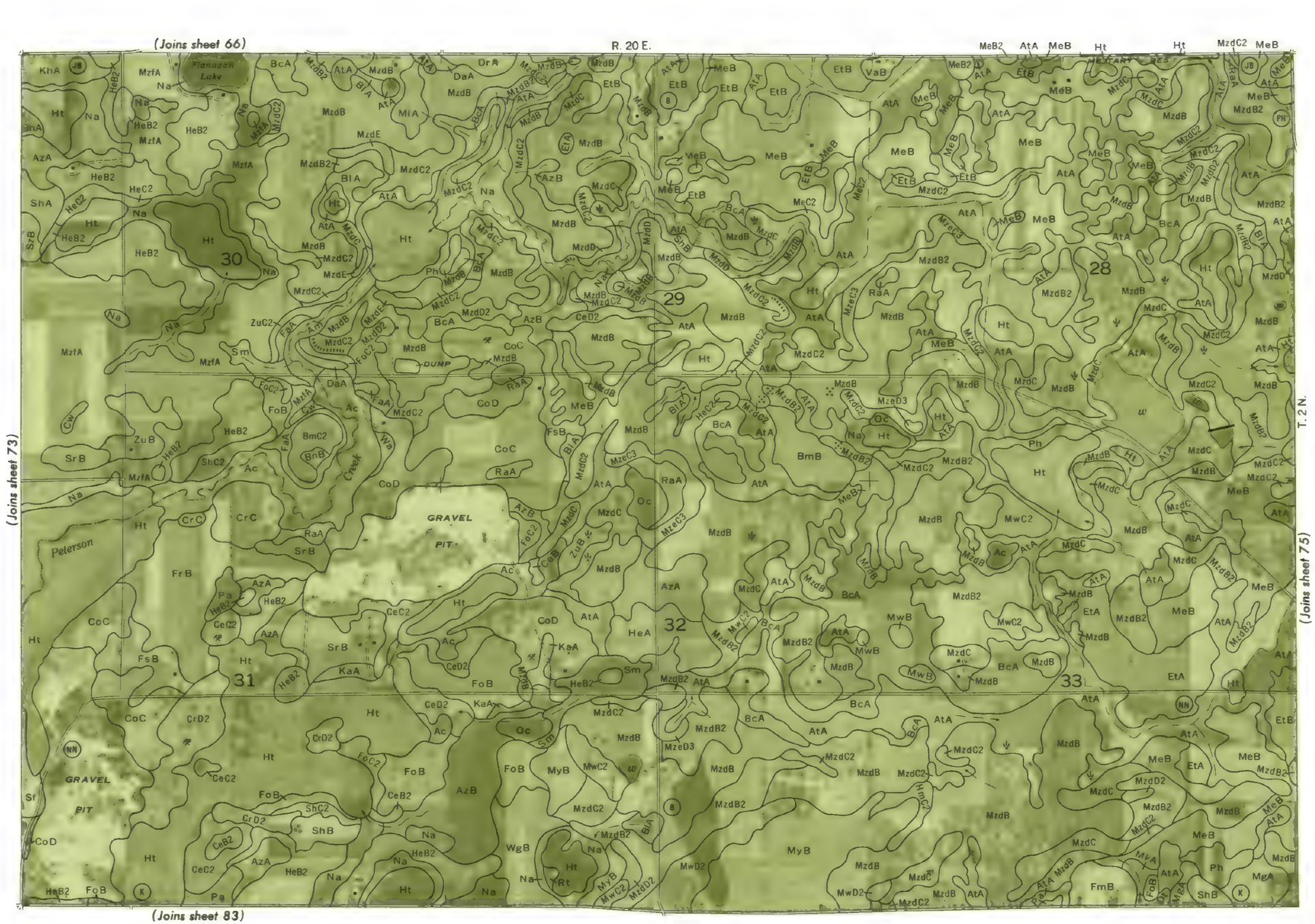
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 73





1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 74

Land division corners are approximately positioned on this map.

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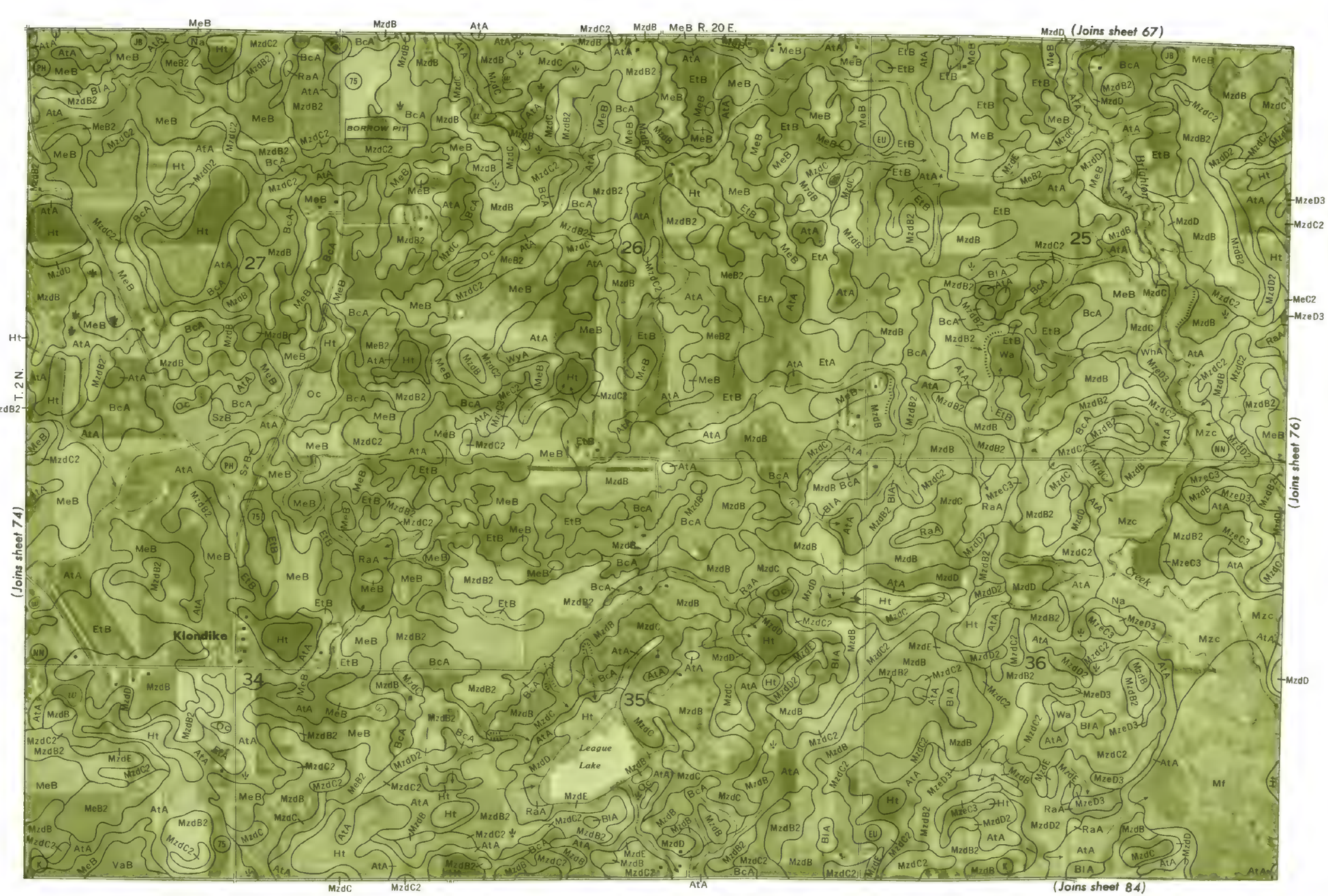

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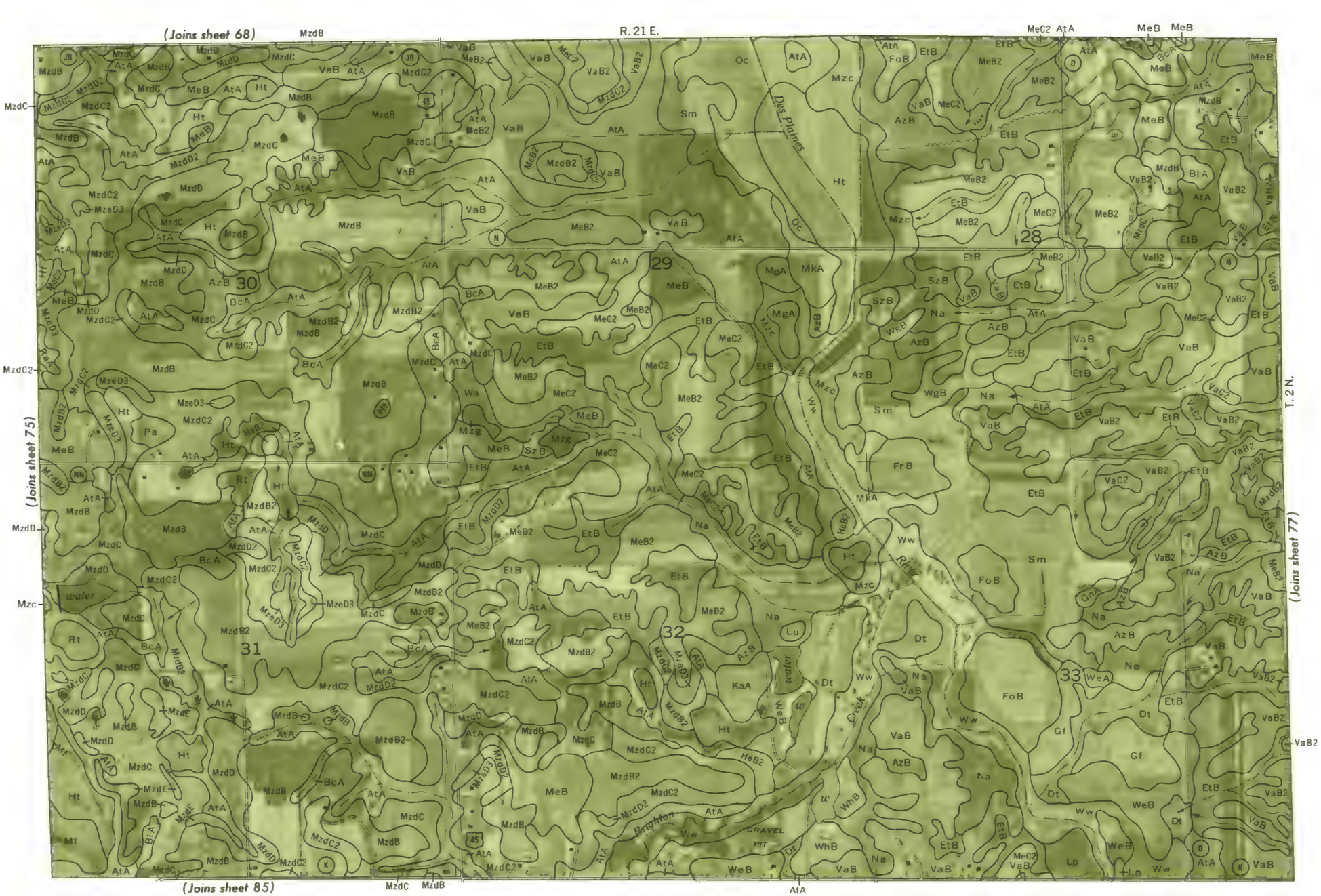
Land division corners are approximately positioned on this map.

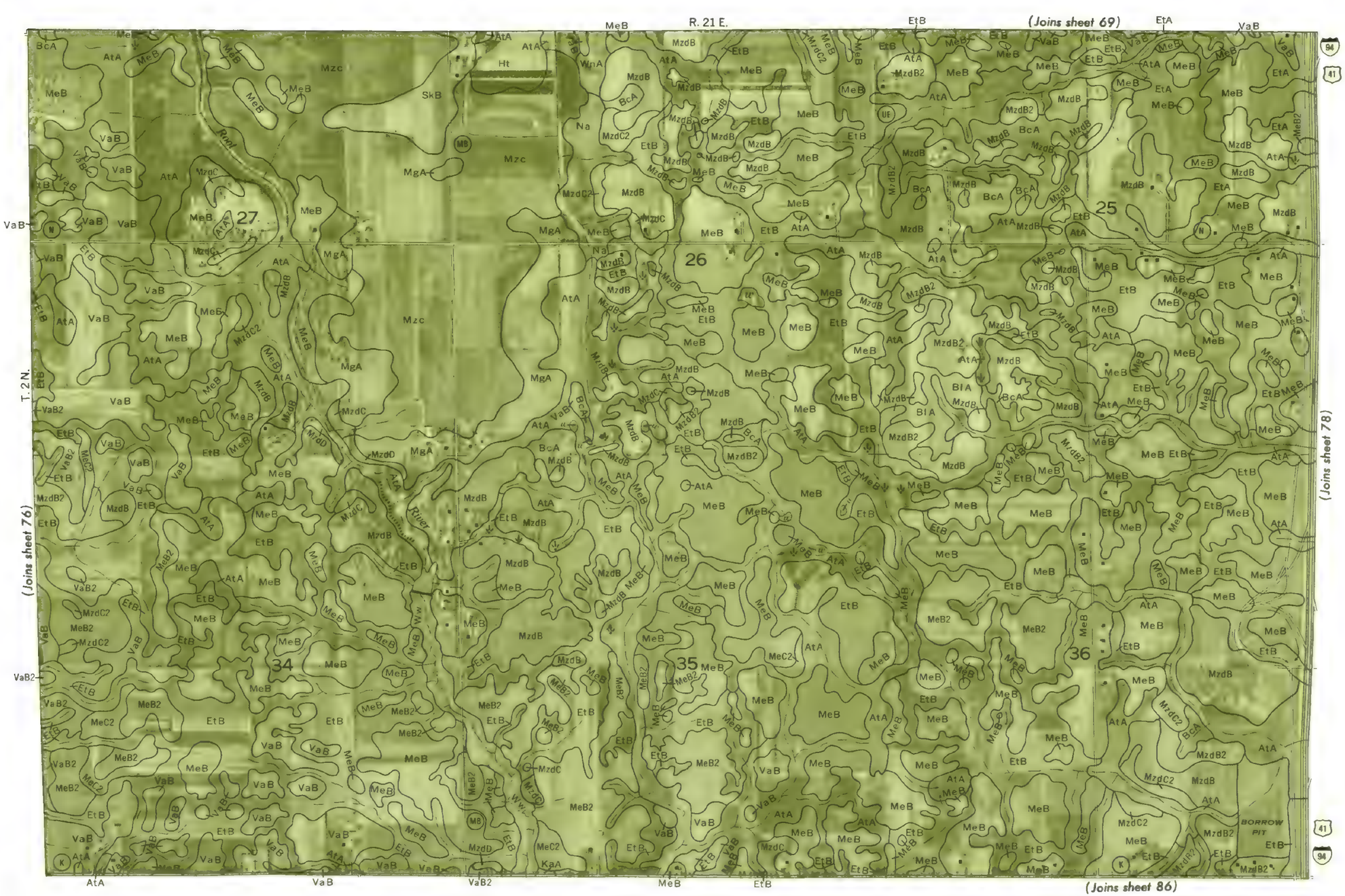
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 75



KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 76

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department, and Wisconsin Agricultural Experiment Station



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Land division corners are approximately positioned on this map.

1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 78

Land division corners are approximately positioned on this map.

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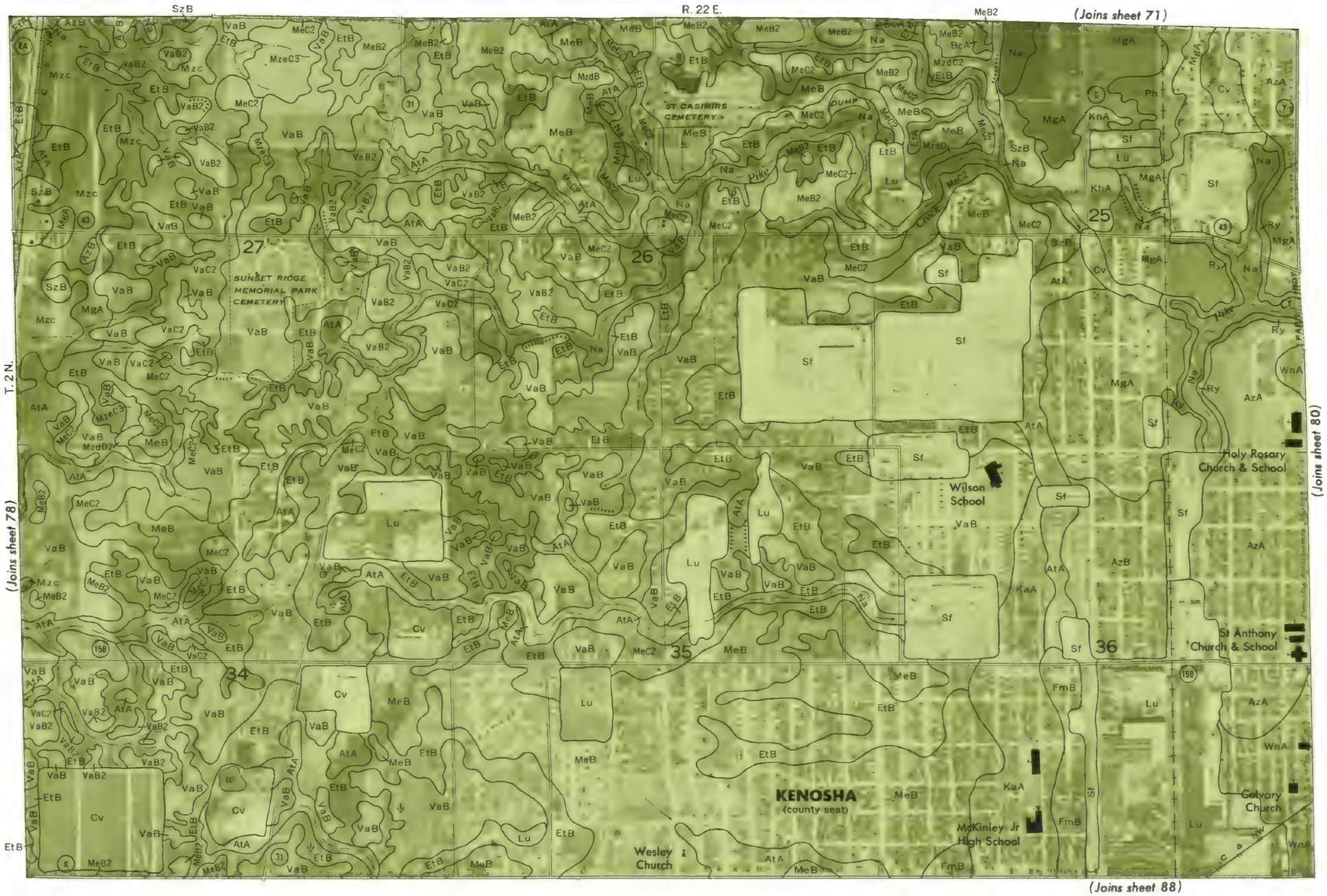
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 79



1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 80

Land division corners are approximately posit oned on this map.

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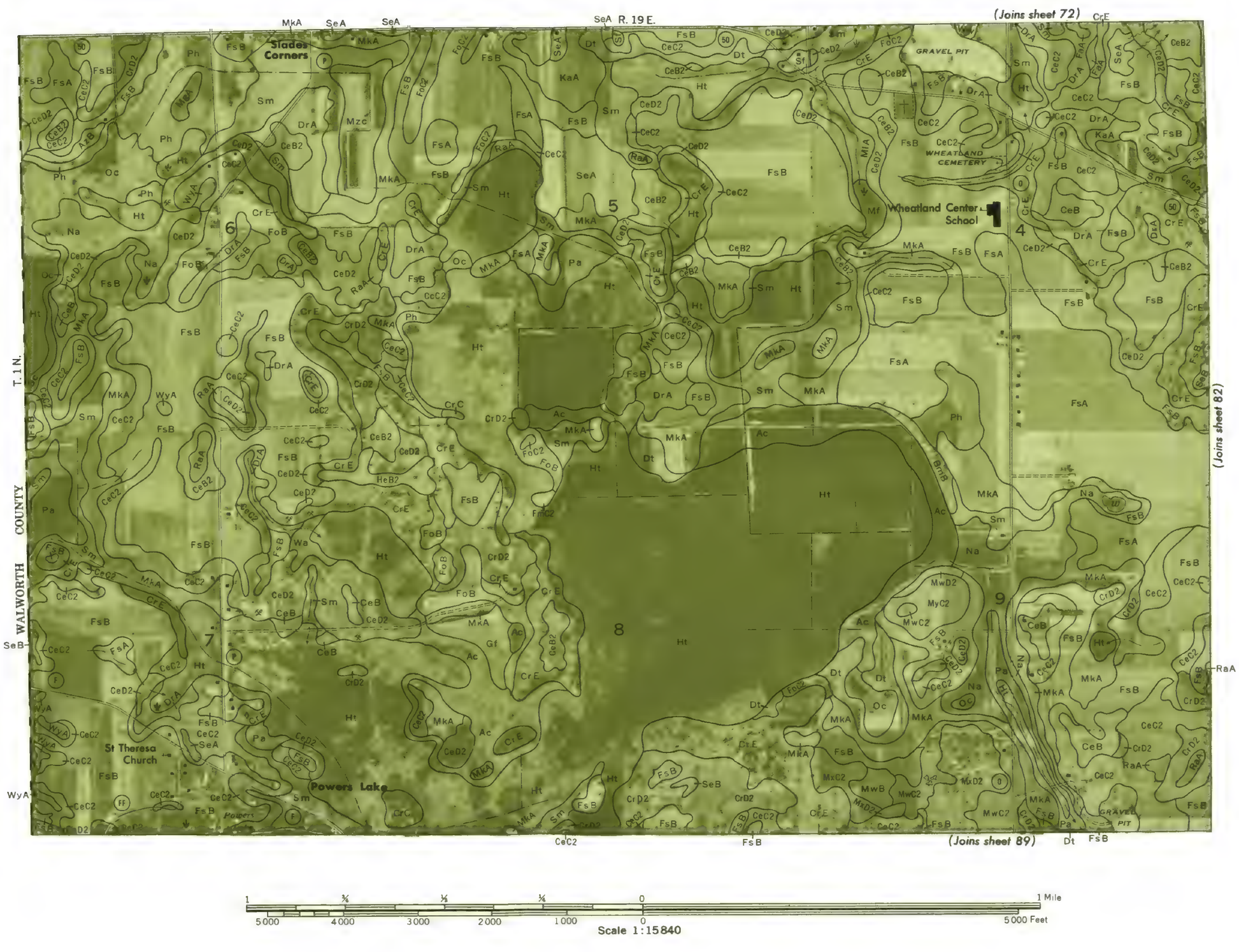
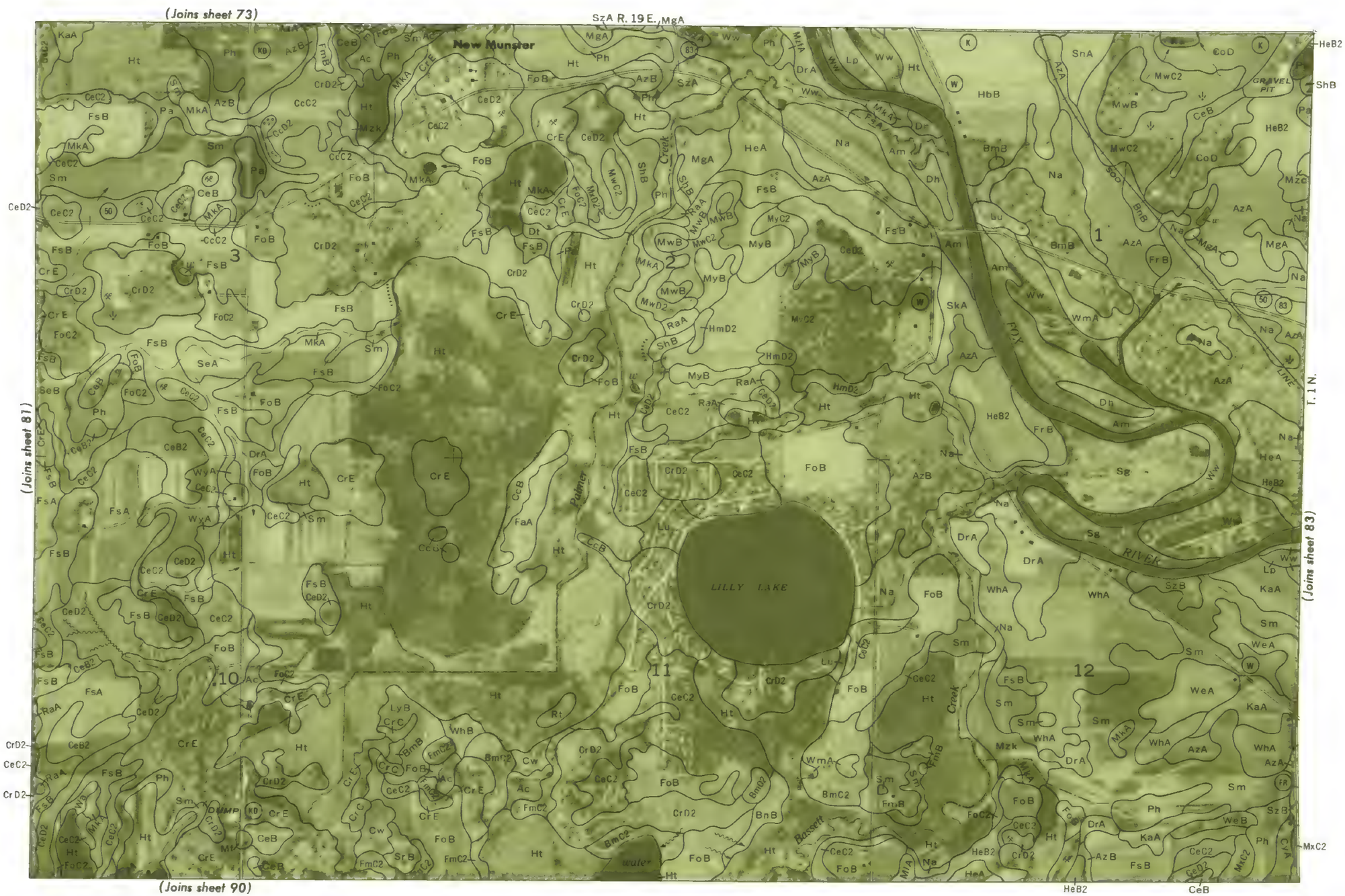
Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 81





1 Mile — 5000 — 4000 — 3000 — 2000 — 1000 — 0 — 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 82

Land division corners are approximately positioned on this map.

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KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 83

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 84

Land division corners are approximately positioned on this map.

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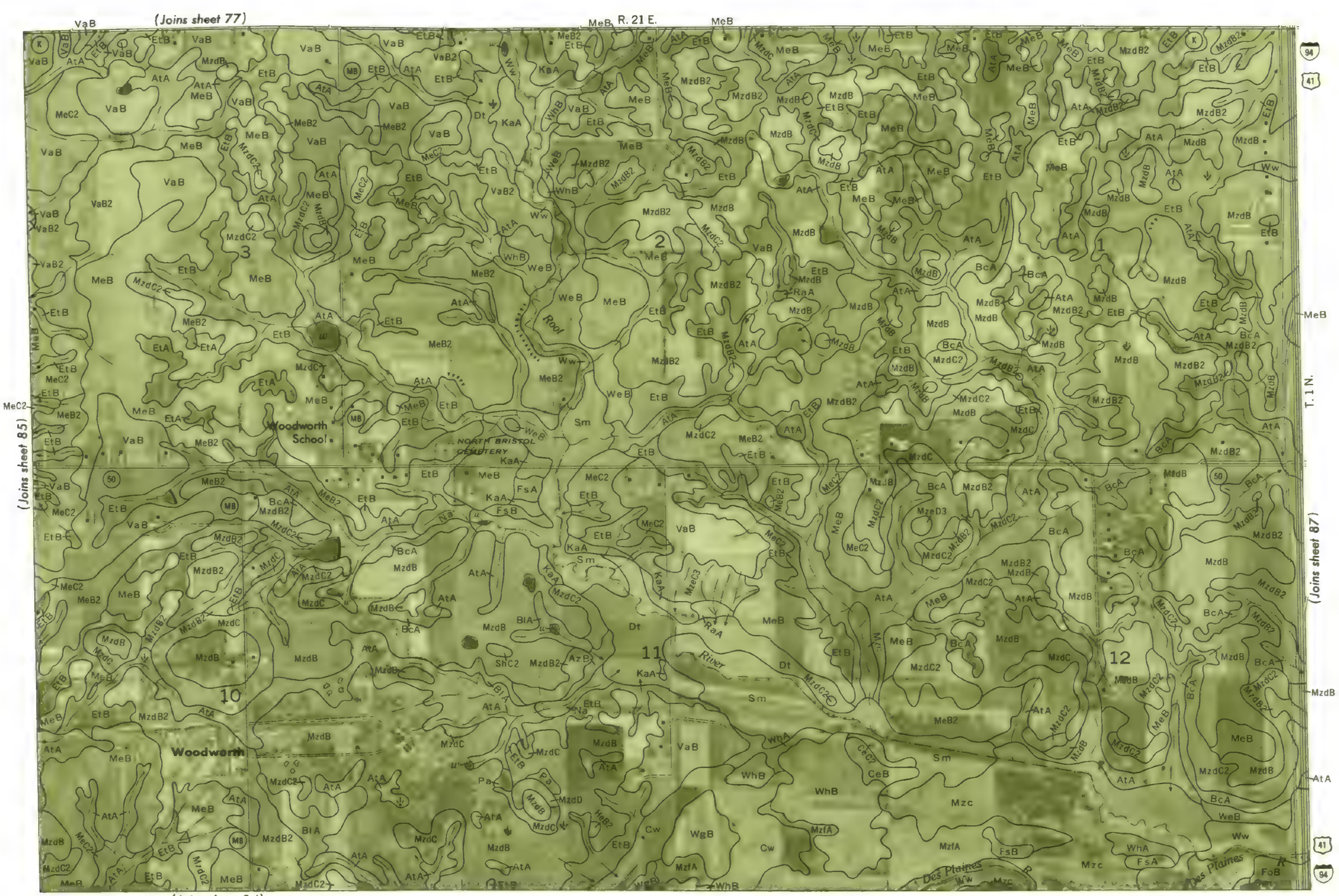
Land division corners are approximately positioned on this map.

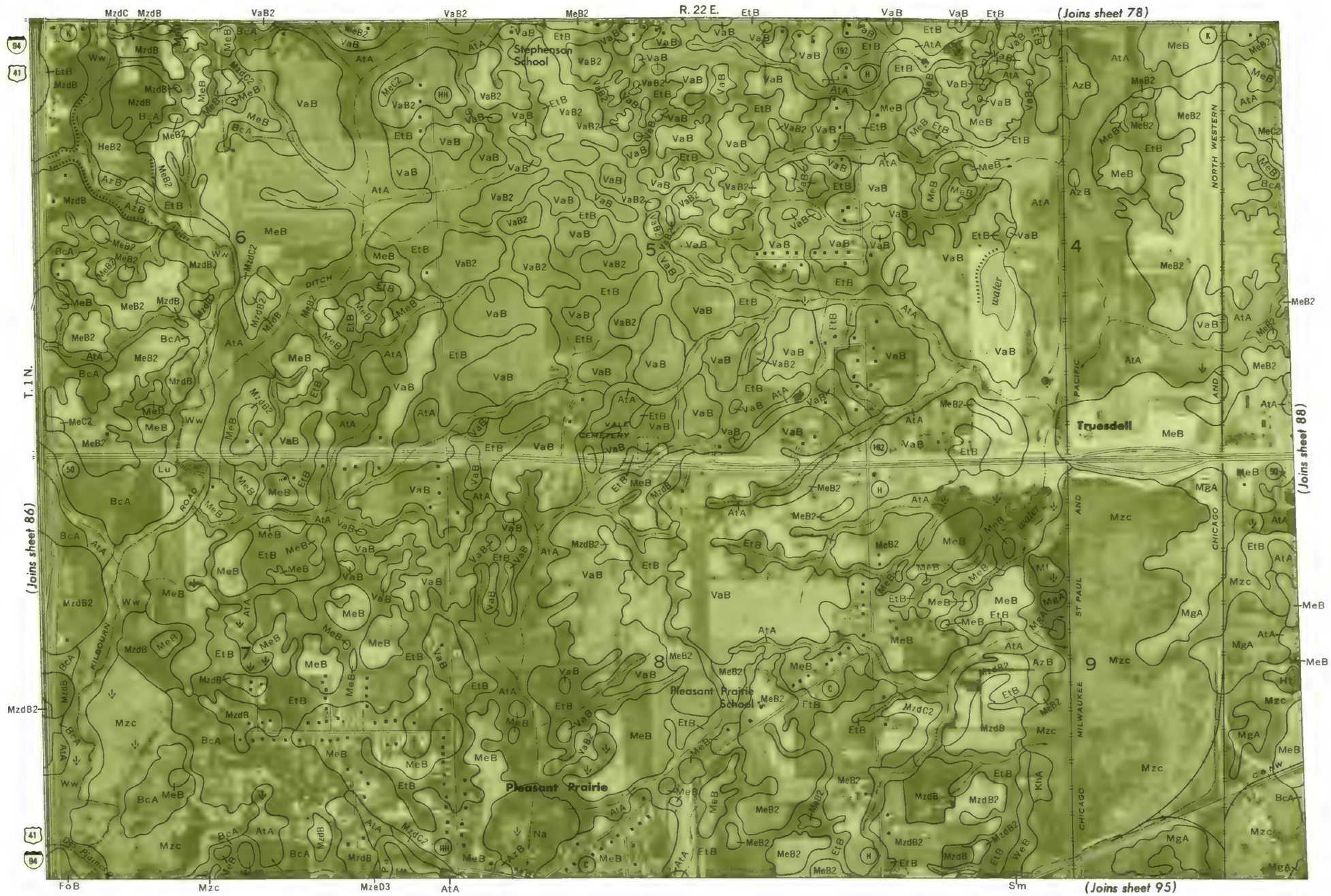
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 85



KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 86

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1969 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soils Department, and Wisconsin Agricultural Experiment Station.



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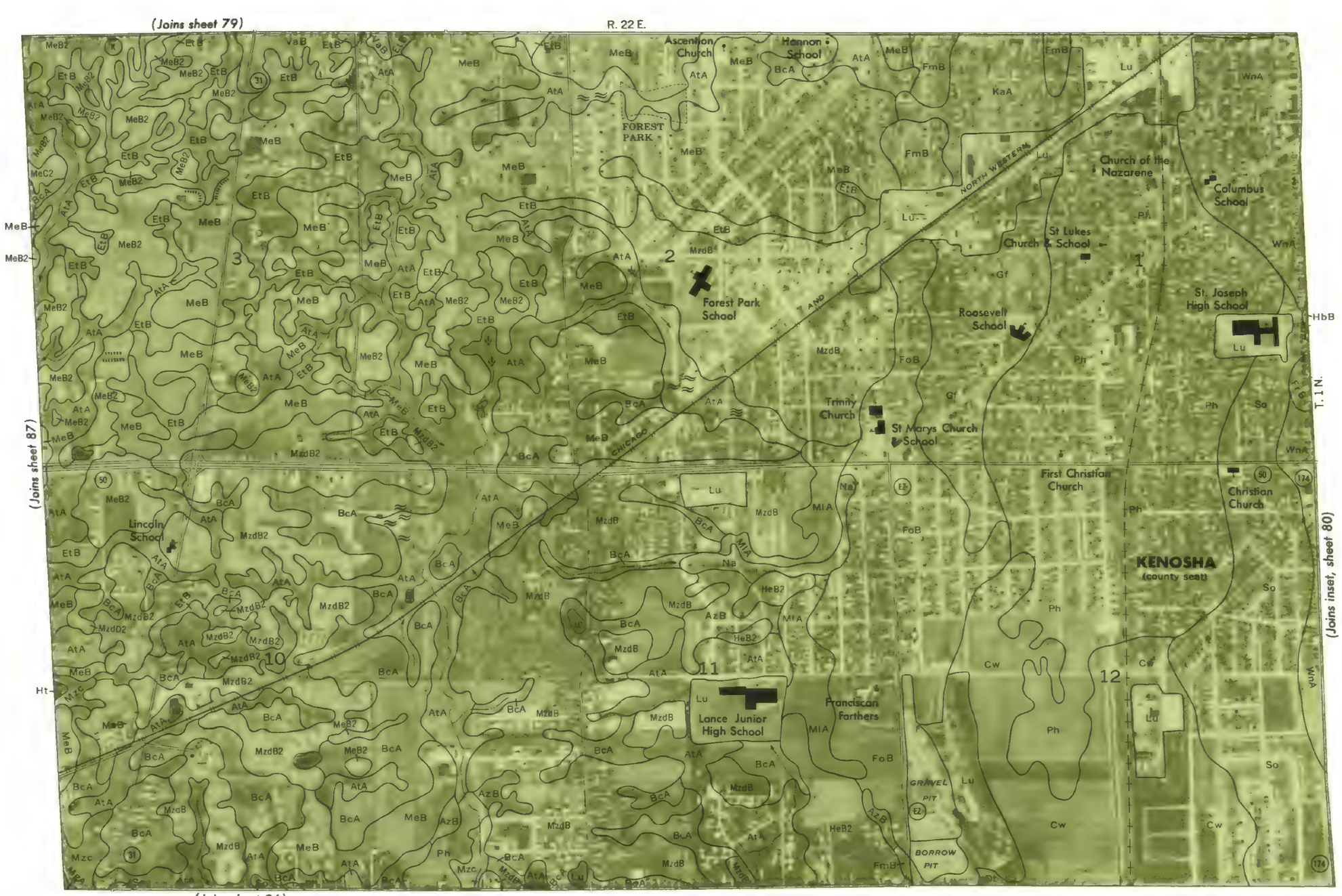
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 87



KENOSHA AND RACINE COUNTIES, WISCONSIN NO.88

Land division corners are approximately positioned on this map.

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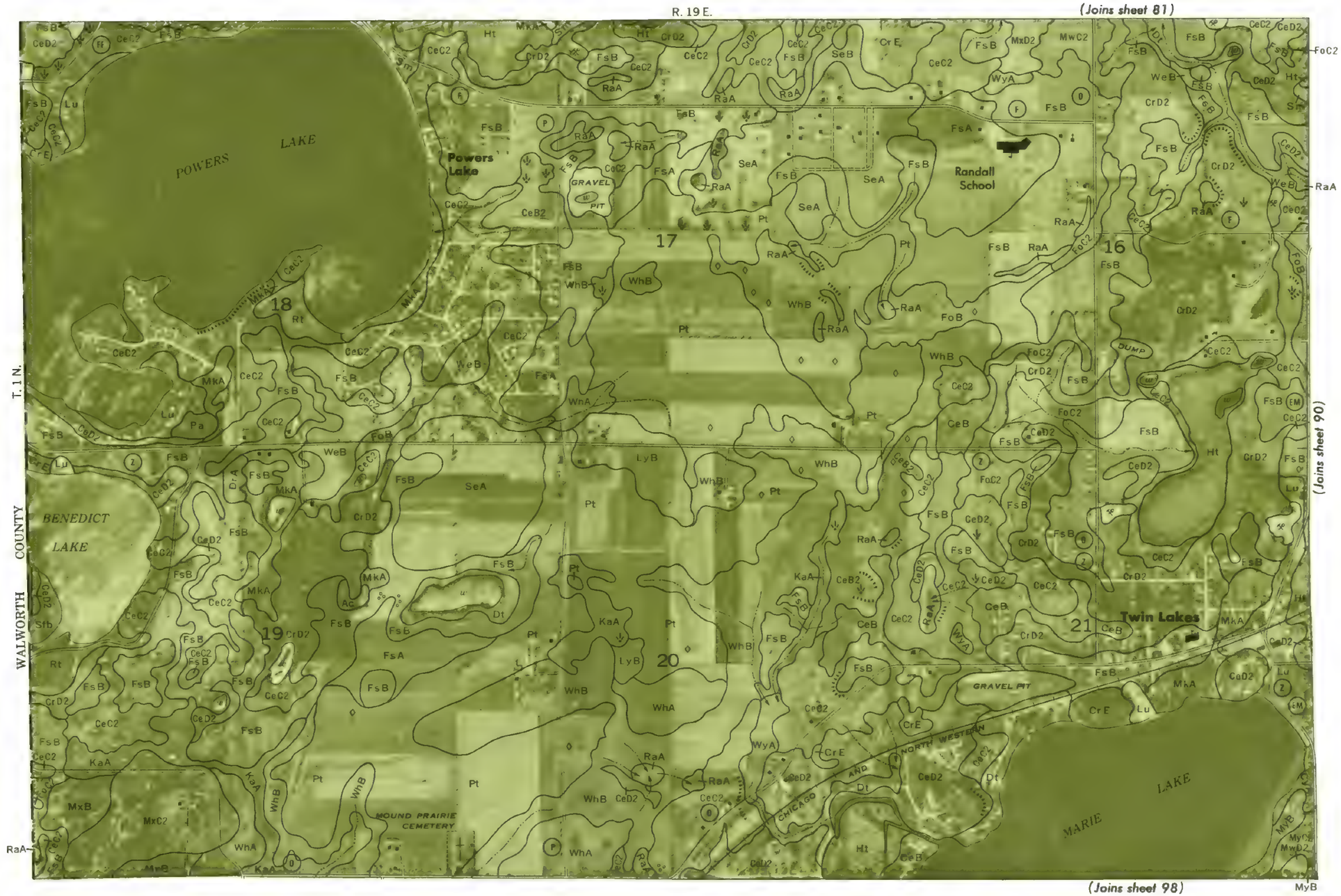
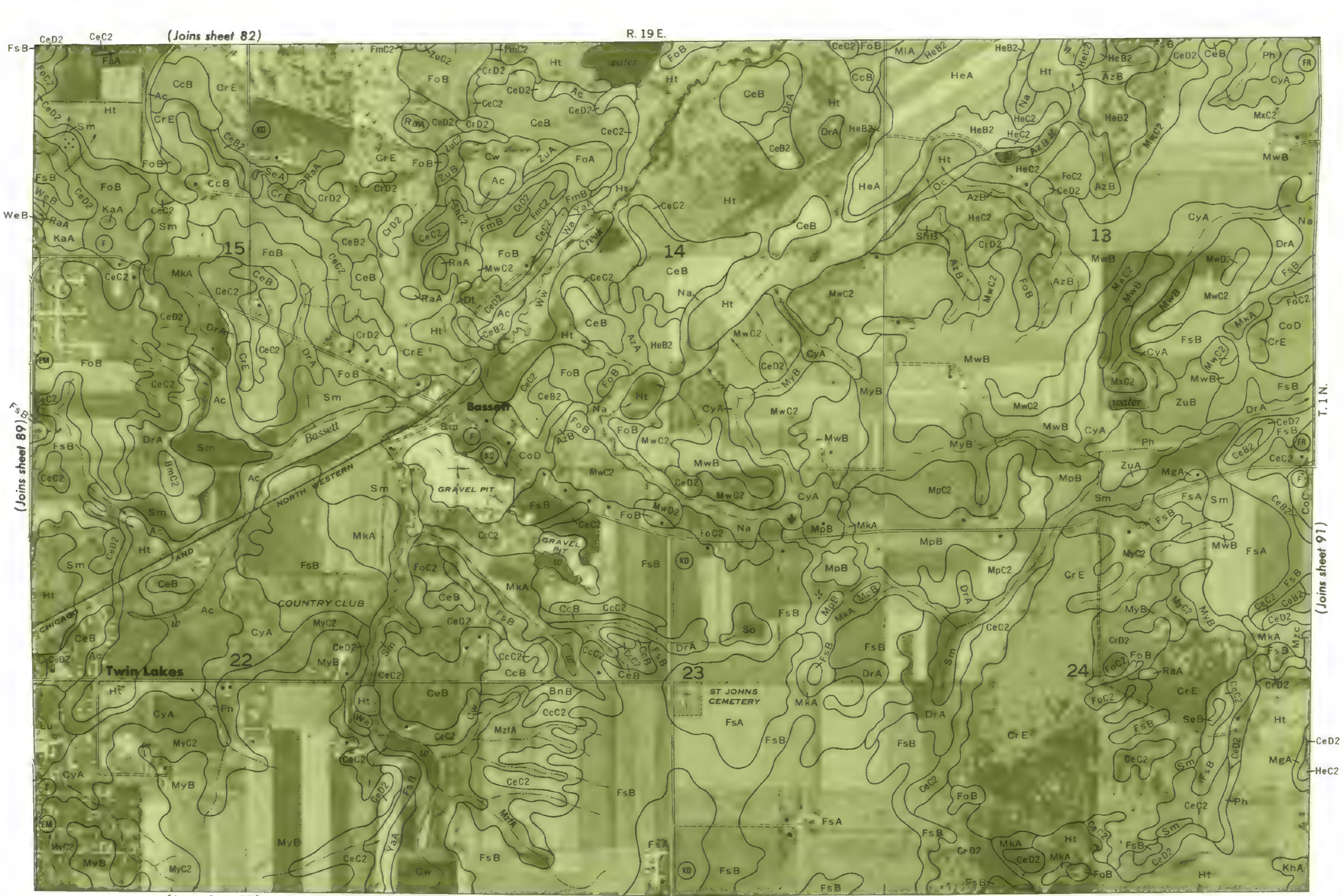
Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO.89





KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 90

Land division corners are approximately positioned on this map.

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Land division corners are approximately positioned on this map.

KENOSHA AND RACINE COUNTIES, WISCONSIN NO.91

1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 92

Land division corners are approximately positioned on this map.

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KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 93

1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

1 ¾ ½ ¼ 0 1 Mile

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:15840

KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 94

Land division corners are approximately positioned on this map.

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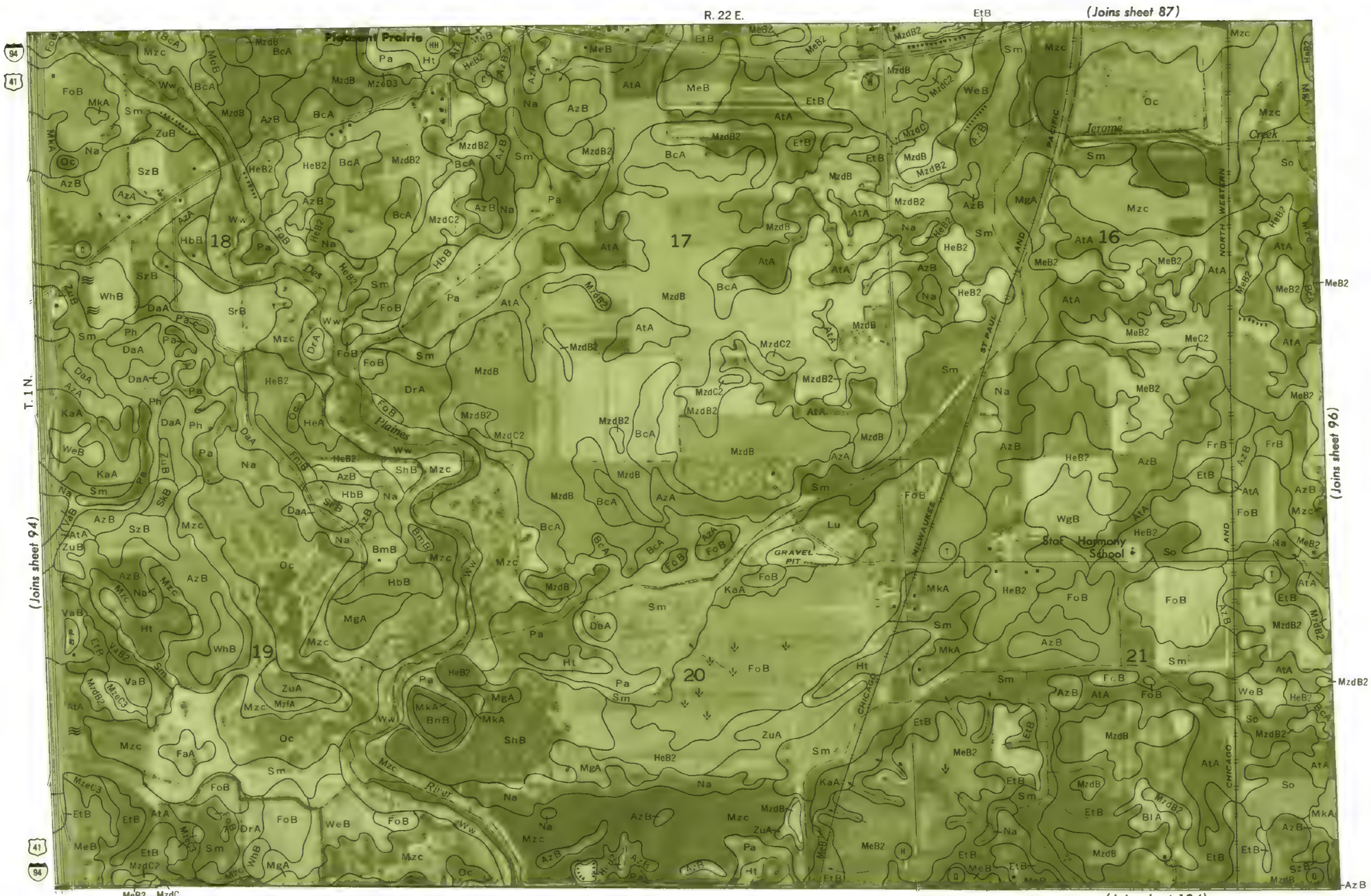
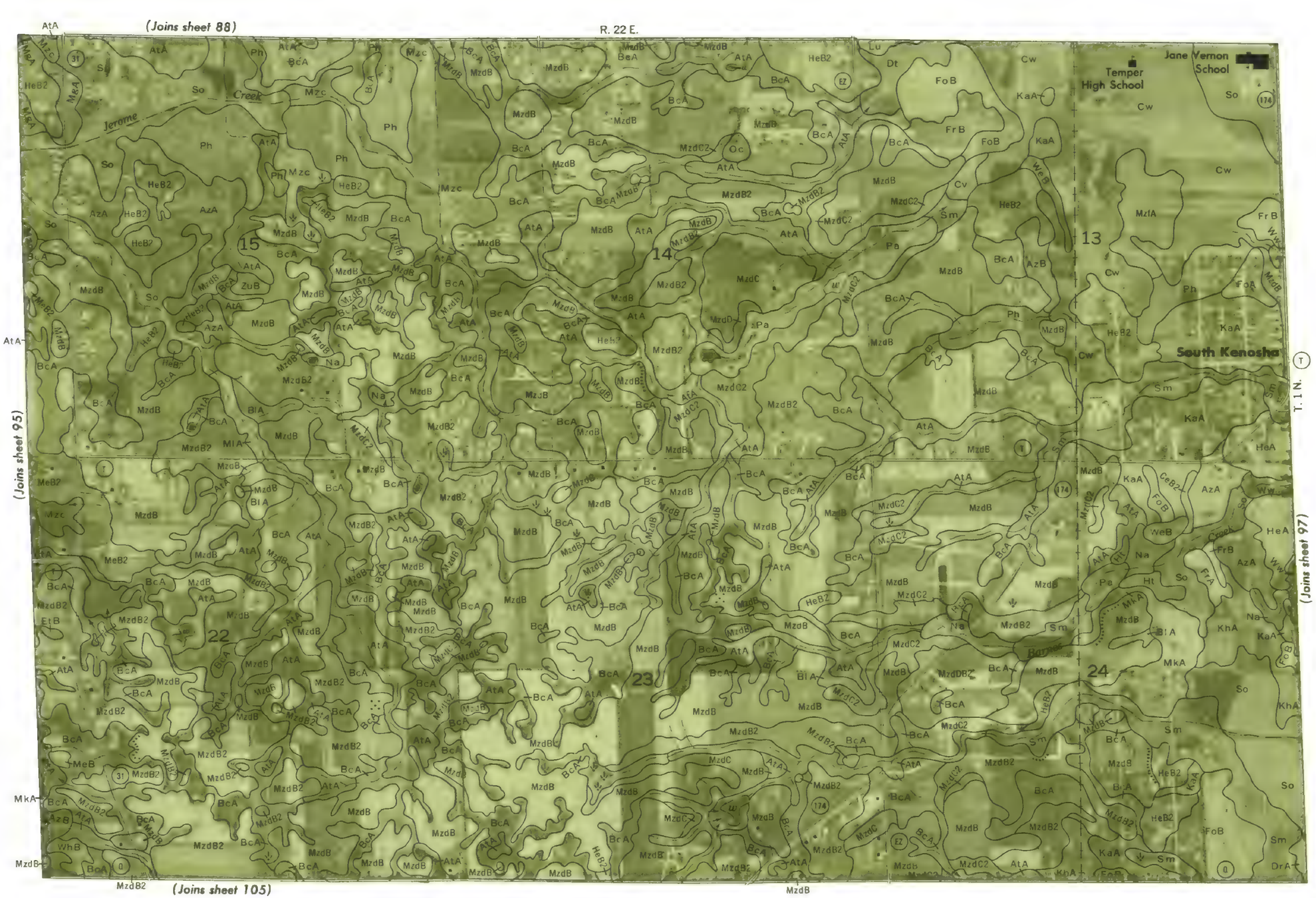
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 95



1 Mile
5000 4000 3000 2000 1000 0 5000 Feet
Scale 1:15840



KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 96

Land division corners are approximately positioned on this map.

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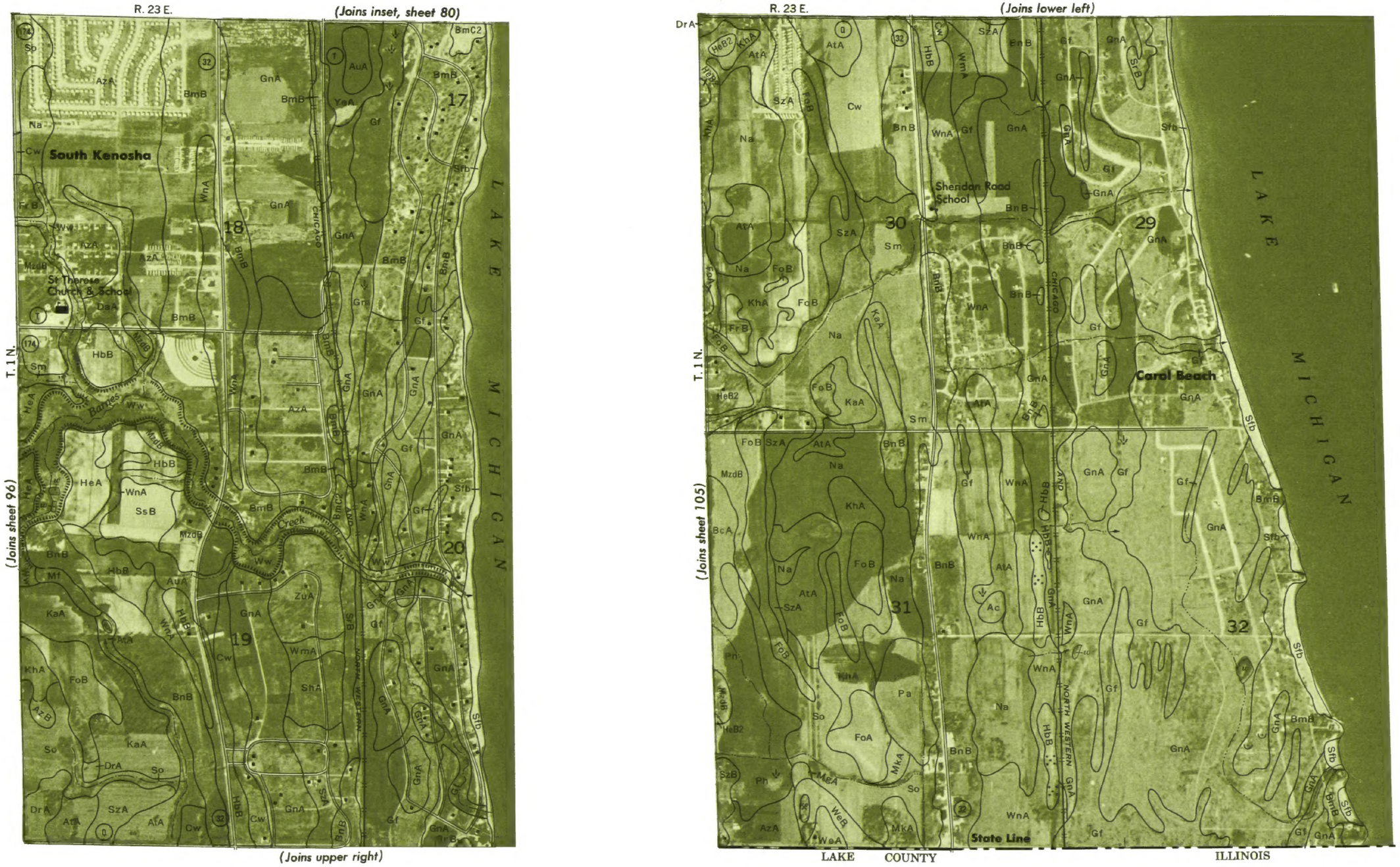
KENOSHA AND RACINE COUNTIES, WISCONSIN NO.97



KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 98

Land division corners are approximately positioned on this map.

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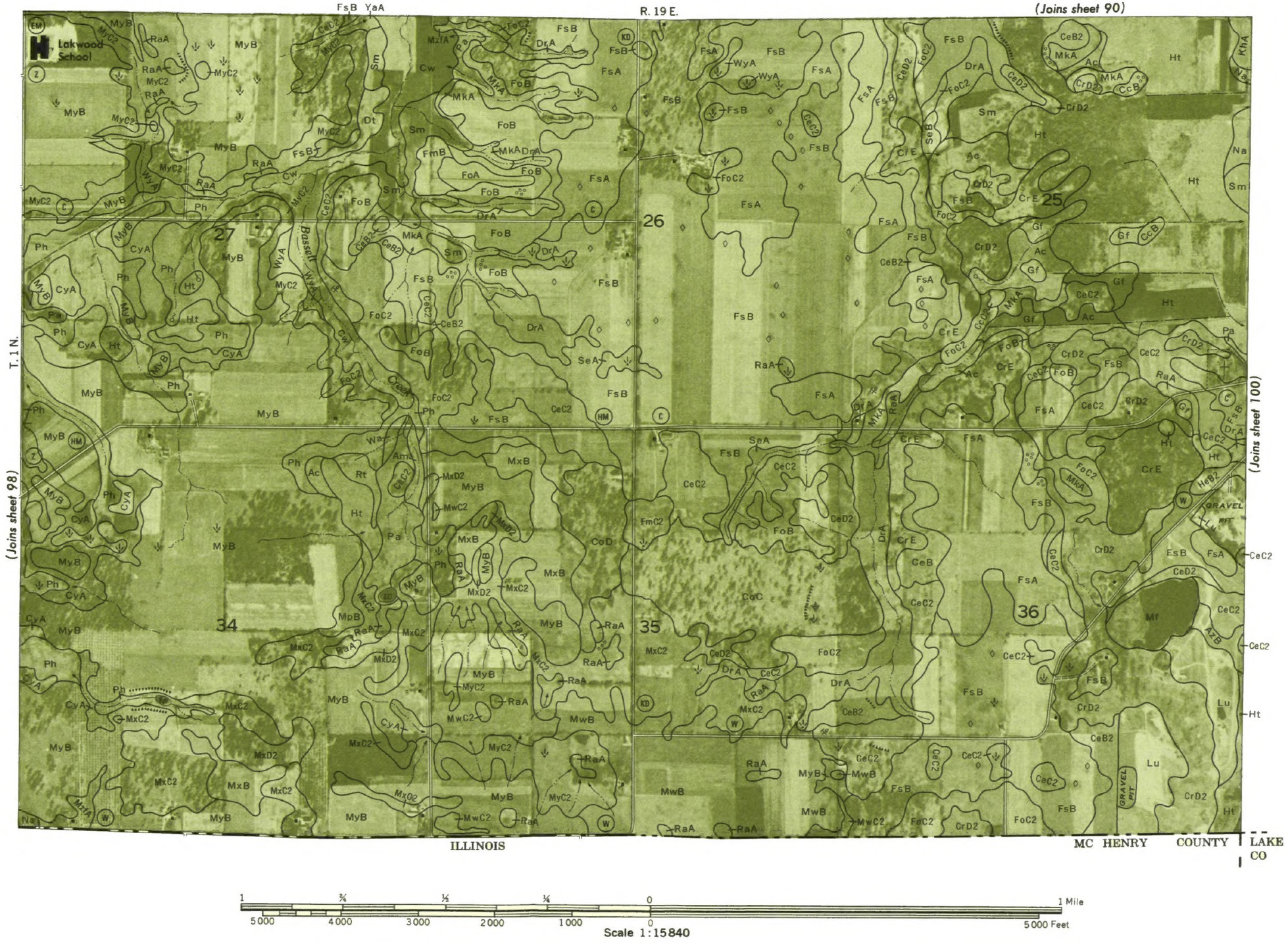
KENOSHA AND RACINE COUNTIES, WISCONSIN NO. 99



KENOSHA AND RACINE COUNTIES, WISCONSIN

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads

- Dual
- Good motor
- Poor motor
- Trail

Highway markers

- National Interstate
- U. S.
- State or county

Railroads

- Single track
- Multiple track
- Abandoned

Bridges and crossings

- Road
- Trail
- Railroad
- Ferry
- Ford
- Grade
- R. R. over
- R. R. under

Tunnel

Buildings

- School
- Church

Mine and quarry

Gravel pit

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Windmill

BOUNDARIES

- National or state
- County
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line

- Perennial
- Intermittent

Streams, single-line

- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches

Lakes and ponds

- Perennial
- Intermittent

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments

- Bedrock
- Other

Prominent peak

Depressions, unclassified

SOIL SURVEY DATA

Soil boundary and symbol

Gravel

Stoniness
- Stony
- Very stony

Rock outcrops

Chert fragments

Clay spot

Sand spot

Gumbo or scabby spot

Made land

Severely eroded spot

Blowout, wind erosion

Gully